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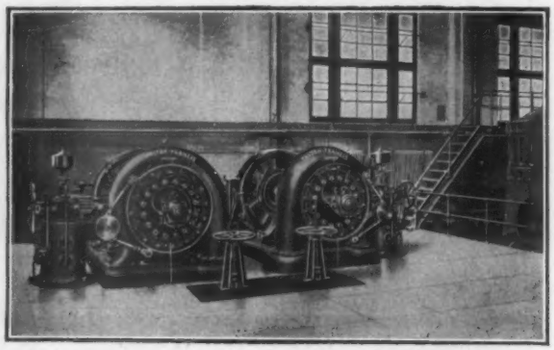

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TO

Place	Population.
Agua Caliente	50
*Alameda	27,000
**Albany	800
††Alta	200
Alvarado	200
Amador	200
Antioch	3,000
††Auburn	2,050
Barber	200
**Belmont	600
Belvedera	350
Benicia	2,500
**Berkeley	42,000
Big Oak Flat	150
Biggs	750
Black Diamond	500
Brentwood	200
Brighton	100
Broderick	500
‡Brown's Valley	50
**Burlingame	5,000
Byron	200
Campbell	1,000
Cement	1,500
‡Centerville	20
Centerville	500
**Chico	13,000
**Colusa	2,700
†Colfax	400
Colma	500
Concord	1,500
Cordelia	150
Corte Madera	350
Crockett	2,500
Crow's Landing	375
Davenport	1,000
Davis	750
Decoto	350
Dixon	1,000
Dobbins	50
Drytown	100
Durham	500
‡Dutch Flat	400
**Easton	500
**East San Jose	1,500
Eckley	20
Emerald	50
Elmhurst	2,500
Elmira	150
El Verano	100
**Emeryville	2,000
Encinal	20
Fairfield	800
**Fair Oaks	250
Fitchburg	250
Folsom	1,500
*Fresno	35,000
Glenn Ellen	500
Gold Run	100
Grafton	350
†Grass Valley	7,000
Gridley	1,800
Groveland	50
Hammonton	500
Hayward	4,000
Hollister	3,000
Ione	900
Irvington	1,000
Jackson	2,000
Jackson Gate	50
Larkspur	950
Lawrence	100
Kennedy Flat	50
Kentfield	200
‡Lincoln	1,500
†Live Oak	200
Livermore	2,250
‡Loomis	150
Los Altos	200
Los Gatos	3,000
Mare Island	500
Martell	25
Martinez	5,000
**Marysville	6,250
Mayfield	1,500
**Menlo Park	1,500
Meridian	300
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Mill Valley	4,500
Mission San Jose	500
Mokelumne Hill	150
Mountain View	2,500
**Napa	6,000
†Nevada City	4,000
Newark	700
‡Newcastle	600
New Chicago	25
Newman	1,000
Niles	800
**Oakland	230,000
Oroville	2,500
Orwood	50
Pacheco	200
**Palo Alto	6,000
†Penryn	250
Perkins	200
**Petaluma	6,000
Peyton	250
**Piedmont	2,000
Pinole	1,500
Pleasanton	2,000
Port Costa	600
**Redwood City	3,500
Richmond	10,000
Rio Vista	200
‡Rocklin	1,050
Rodeo	100
†Roseville	345
Ross	900
***Sacramento	52,000
San Andreas	200
San Anselmo	2,500
San Bruno	1,500
San Carlos	100
**San Francisco	450,000
**San Jose	40,000
San Leandro	4,000
San Lorenzo	100
**San Mateo	7,000
San Pablo	1,000
**San Quentin Prison	1,600
**San Rafael	6,000
Santa Clara	8,000
Santa Cruz	10,000
**Santa Rosa	8,000
Saratoga	200
Sausalito	3,000
Sebastopol	2,000
Selby	100
Sonoma	1,200
South San Fran	2,500
Stanford University	2,000
Stege	100
‡Stockton	25,000
Suisun	1,200
Sunnyvale	2,000
Sutter Creek	2,000
Tiburon	100
Tormey	150
‡Towle	200
Tracy	1,200
Vacaville	2,500
**Vallejo	12,000
Vallejo Junction	10
Walnut Creek	350
Wheatland	1,400
Winters	1,200
**Woodland	3,500
Yolo	350
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Service Furnished	Number of Towns	Total Population
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Gas	33	988,900
Water	17	43,415
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3 steam-driven electric plants in big cities.

18 gas works

SERVES ⅔ of California's population

26 of California's 56 counties

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3/5 the size of New York state

½ the size of all the New England states combined

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JOURNAL OF ELECTRICITY
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ISOLATED VERSUS CENTRAL STATION PLANTS

Much interest attaches to the live question of central station service as opposed to isolated plant service. Similar to many other fine points in engineering practice, local conditions must be the deciding factor in each particular case. At times there arise questions of stability of service, cost of maintenance and operation of such a nature as to make it good judgment to close down the operating department of the isolated plant in favor of the central station supply, even though the very best and latest type of installation has been made in the smaller plant. On the other hand, many instances can be cited where the isolated plant has proved the unquestioned superior, and still others where a combination of the two prove the more economical, such, for instance, as the installation at the University of California. Here the central station is called upon to assist in carrying the peak load and other portions of the daily load which prove uneconomical or too cumbersome for the local installation. A recent instance of a case in which the central station has won out over the isolated plant system is that of the U. S. Mint at Denver, Colo. We are indebted to R. B. Mateer of the Denver Gas & Electric Company, for the data furnished regarding this installation.

Government buildings possess a distinctive style of architecture and are universally admired for the simplicity and beauty of the exteriors. As a rule they are a class of buildings so equipped as to be independent of all quasi public utility corporations. For instance in some are found an artesian well to provide the water; an elaborate, yet very efficient steam and electric generating plant to supply all necessary heat, the power desired for the operation of machinery and the production of artificial light, which go to make a very complete and isolated class of buildings.

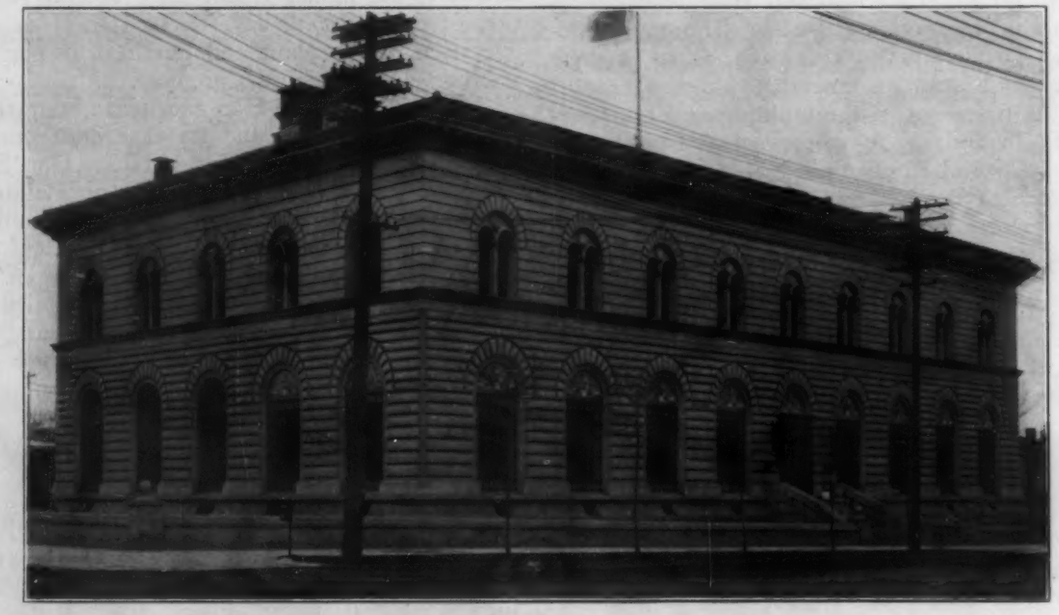


Fig 1. U. S. Mint at Denver, Where Central Station Has Proved Superior to Isolated Plant Service.

The Mints, that provide the gold, silver and copper mediums of exchange, are equipped with the finest engines, generators, motors and auxiliary machinery that can be manufactured. The equipment must possess certain requirements superior to those exacted by the average industry. A different rating, certain

length of tests, certain quality of materials are required of such apparatus as is sold for governmental buildings. The motor must be adapted for that particular class.
of machine. Nowhere can be found apparatus possessing so many good points as in the Mints located at various centers of industry and population. Good judgment and experience have resulted in an isolated plant of the latest and most efficient type at the Mint at Denver, Colorado.

The machine in each department is direct connected to its individual motor. The huge rolls are operated with 50 h.p. Crocker-Wheeler motors, the coining machines with Westinghouse and Crocker-Wheeler 7½ h.p. motors. A complete machine shop with each lathe, drill, grinder, planer, saw and milling machine direct connected to a motor, is located in one section of the building, while in another is found an individual motor-driven installation of woodworking machinery, including a jigsaw, planer, circular saw, mortising machine, lathe, molding machine, sand paper machine and emery wheel.

Otis elevators and lifts render access to each portion of the building easy and economize in time as well as physical energy.

Motor operated reviewing and weighing machines assure perfect coins for the use of the public.

Exhaust fans, properly installed, preserve the health of those employed at the building and rapidly discharge to the outer air injurious acid fumes.

Gas and oil furnaces are used in the assaying departments. To supply the necessary air to produce the proper combustion, Connerville blowers are installed in the basement of the building and are operated by 20, 15 and 5 h.p. motors of Westinghouse, Bullock and General Electric product.

A feature of the basement, is an Ellspass Mill, used in concentrating. A 15 h.p. Fairbanks Morse motor operates this machine while 2 h.p. General Electric motor drives the centrifugal pump.

The compressors for the deep wells and house pumps are in duplicate,—accident to one permits of an abundant supply from the remaining one. The compressors are each operated by a 20 h.p. Commercial Electric motor and the house pumps are direct connected to 3½ h.p. Commercial motors.

A special motor, for each machine, varying from 50 h.p. on the rolls to the ½ h.p. motors that operate the ringing sets of the telephone exchange makes a total connected motor load of 708½ h.p., 220 volt direct current.

Ample lighting is provided by 1500 lamps of from 60 to 100 watt tungsten filaments.

The building is complete with every mechanical labor saving device. It contains an engine room equipped with the most efficient machinery money could purchase or human intelligence design, yet isolated completely so far as water, heat, light and power —necessities, were concerned.

In June of this year arrangements were completed whereby the isolated plant was discontinued. Central Station service supplied by the Denver Gas & Electric Light Company replaced the isolated plant that had been installed several years ago; 250-500 volt three-wire direct current is now supplied for the operation of the entire 708½ h.p. motor load; 110-220 volt three-wire single-phase alternating service supplies the artificial light.

"Good service at all times" such as is rendered by the Denver Gas & Electric Light Company, has brought about perfect satisfaction and this combined with the resultant economy is an excellent proof of the value and superiority of the central station service.

All negotiations for this business were conducted by the power department of the Denver Gas & Electric Light Company, which has secured for the central station service a revenue producer and augmented the connected load, far in excess of earlier expectations.

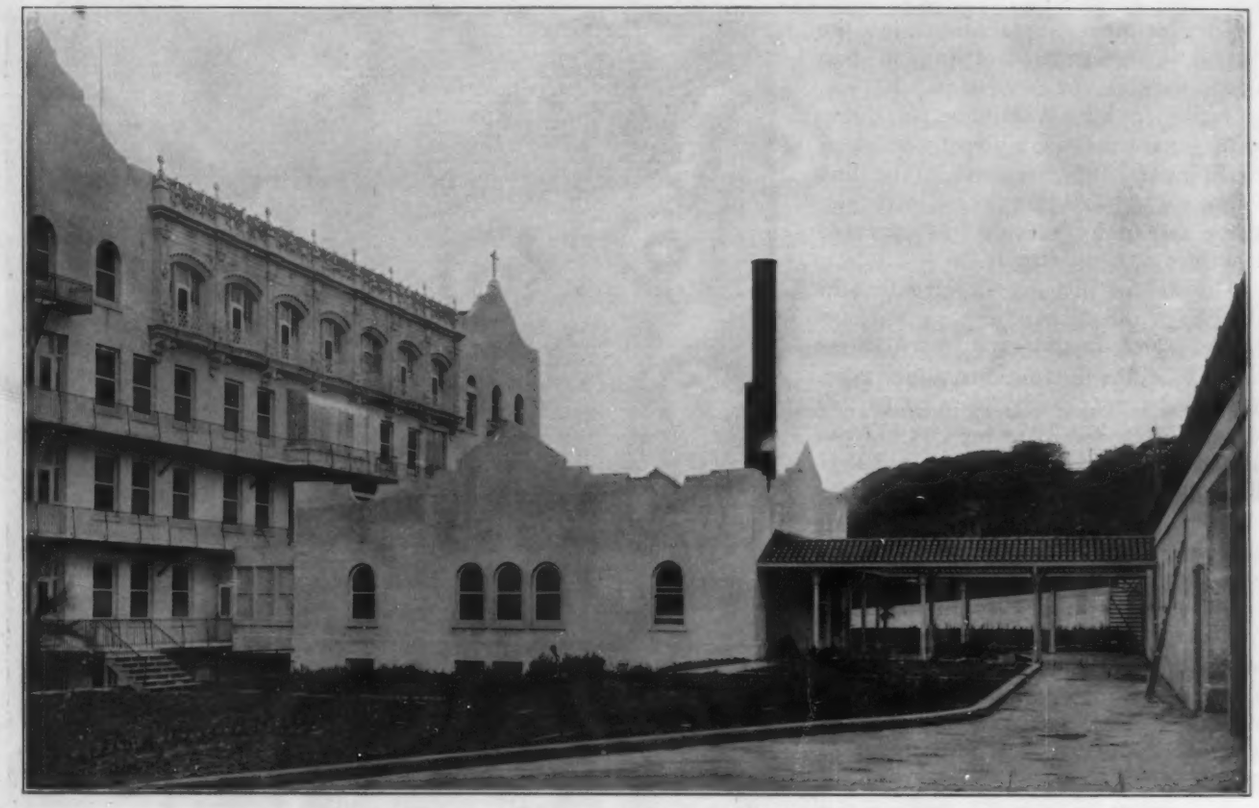
When originally constructed the St. Francis Hotel of San Francisco was provided with a power equipment suitable for all service other than furnishing the electrical energy required. In the spring of 1909, the management considered the installation of its own electric plant and after careful investigation the advantages to be derived therefrom secured its adoption. The plant as completed has a total capacity of 825 kw. The St. Francis hotel is the largest and perhaps the most completely equipped hostelry in San Francisco and its appointments are such as to promote the comfort and freedom of its guests. Its entire electrical equipment is in full harmony with the general make-up of the building and has had its proportionate care and thoroughness in design. Recently, however, the management, after careful reconsideration of every detail, have decided to close down the operation of the plant and purchase power from the Pacific Gas & Electric Company.

On the other hand, an excellent illustration of the isolated power plant and its ease and continuity of operation is that of St. Mary's Hospital in San Francisco. The field of operation for an isolated power plant included in the equipment of quasi-public buildings is nowhere better exemplified that for use in the modern hospital. Here electricity is put to scores of uses and the auxiliary features of the plant, i. e., the distribution and circulation of steam, hot and cold water, compressed air or vacuum, together, make almost every condition of operation and action except of course, the human element, dependent upon the power plant.

The equipment of St. Mary's hospital in San Francisco is perhaps as complete and thorough as modern science can dictate; the arrangement, unlike many isolated equipments having been worked out to accomplish the best results in efficiency, ample space, light, air and general accessibility.

The power plant occupies the ground floor, which is in reality a basement, as it is a few feet below the ground surface. There are at present two main generating sets, which are duplicates. The engines are Brownell high speed, non-condensing. They are fitted with Rites inertia governors and direct connected to General Electric six-pole, 75 kw., 250 volt direct current generators, operating at 275 r.p.m.

Among the many high class features of this installation is to be mentioned the comprehensive system of signal lights and calls from all rooms. Instead of the familiar bells or buzzers, which are often annoying to nervous patients, there is on each floor

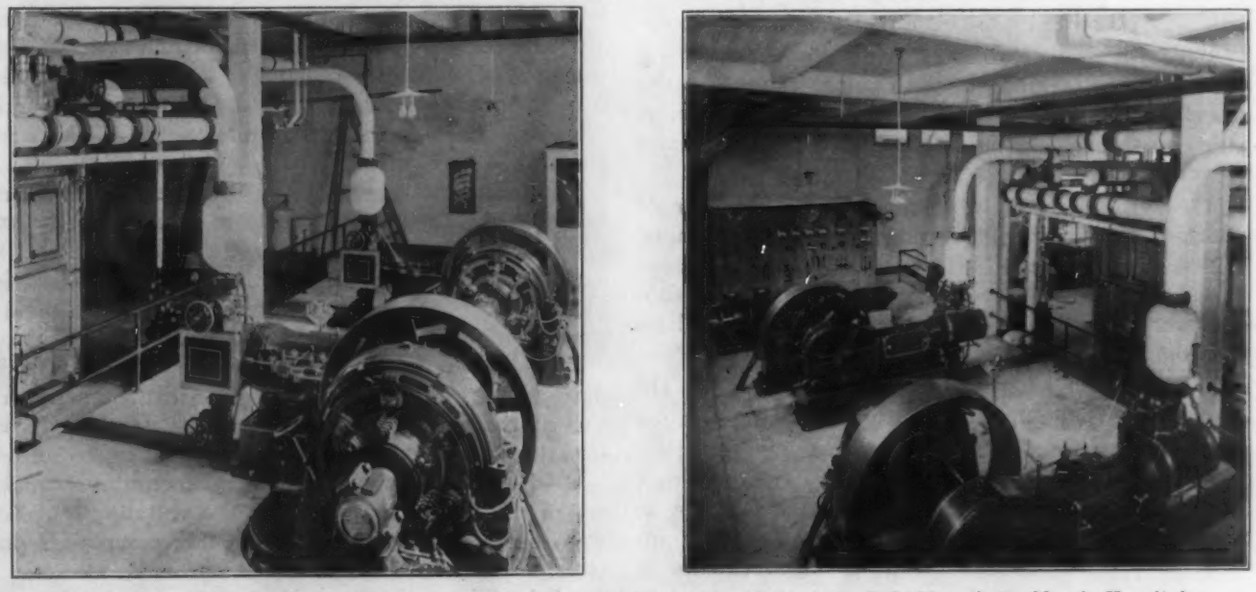


Typical Isolated Power Plant, St. Mary's Hospital, San Francisco.

a Westminster chime of four tones. These chimes consist of bell-metal tubes which are sounded by an electrically operated hammer. The different pitches of tone denote nurses or attendants of different grades of authority, while the number of strokes signify the individual wanted.

Another novelty is an arrangement for electrically heating the tray carriers. These carriers are of sheet metal in the form of a large box in which are fitted shelves, the whole, being mounted on rubber-tired wheels. Within is a heating coil which enables food in trays to be kept warm while the carrier is being filled and during its journey to the various wards. At a convenient place near the kitchen, there are several wall plug receptacles supplying the current to heat the tray carriers and a set of baby knife switches provided directly under them control the current.

No less striking in its accomplishment of continuity of service is that of the isolated power plant in the Alaska Commercial Building. As a safeguard against any possible break in the service there have been installed storage batteries of sufficient capacity to tide over any reasonable period due to a breakdown of any part of the installation.



General View of Engine and Boiler Room and View of Generating Units from Switchboard, St. Mary's Hospital.

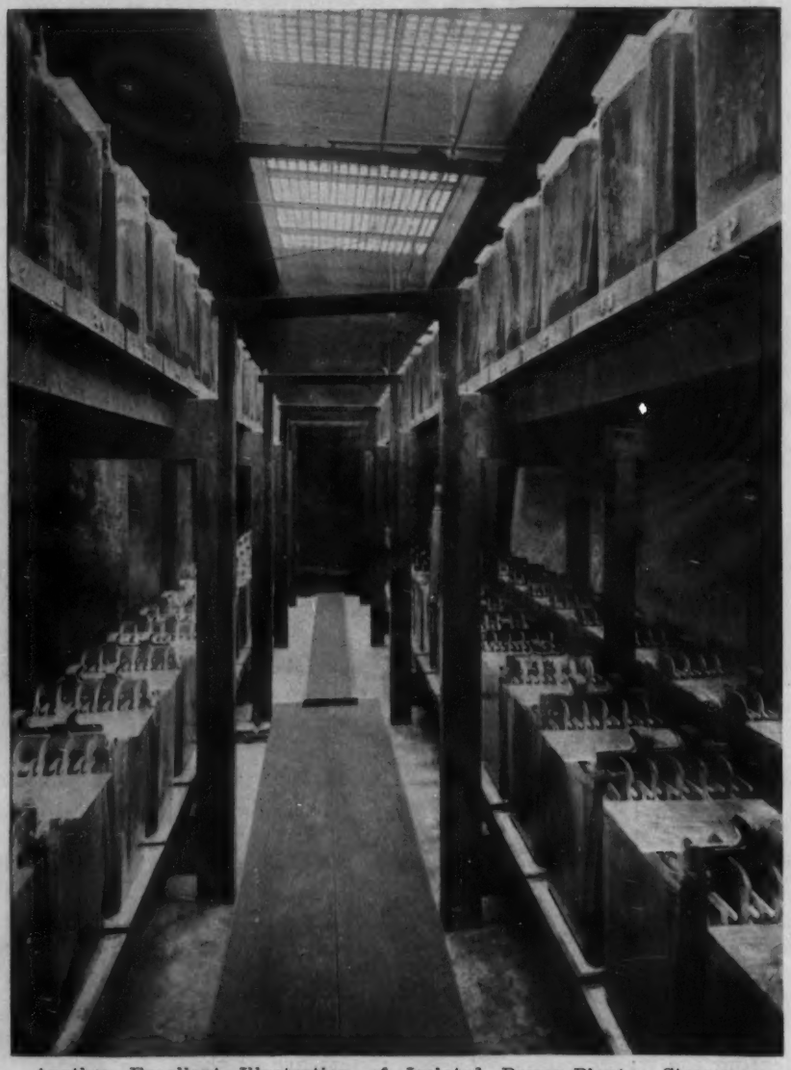
The original installation in the Alaska Commercial Building in San Francisco, Cal., consisted of two 100 kw. and one 75 kw. Westinghouse three-wire generators, each direct connected to Skinner simple engines. The line voltage was 120-0-120. The electric elevator and motor service was operated from the 240 volt circuit.

The use of the electric elevators in this large office building caused extremely violent and rapid fluctuations in the load, the fluctuations, under average conditions, being from 20 to 250 kw. and occasionally as high as 400 kw. These fluctuations were so rapid that the voltage regulation was extremely erratic, as the engines were not driven sufficient time to compensate for the changes in load.

This plant, besides supplying electricity and steam to the Alaska Commercial Building, also sells power to neighboring office buildings, for lights, elevators, etc., and had an average monthly load in the neighborhood of 20,000 kw. hours. The plant was operated originally from 7 o'clock in the morning until 11 o'clock at night, power for the remaining 8 hours of the day being obtained from the city service.

The effects of the fluctuations in load follow:

1st—It was necessary to have operating, sufficient capacity for the maximum load at all times or otherwise frequent interruptions in service ensued.



Another Excellent Illustration of Isolated Power Plant. Storage Batteries for Alaska Commercial Building.

2d—Due to the low power factor, the efficiency was very low and the only consumption per kw. hour very high.

3d—The voltage regulation under these conditions was poor, and was a source of numerous complaints.

4th—The "racking" of the engines caused by the violent fluctuations in the load was rapidly deteriorating and the same would shortly have made repairs necessary.

On account of these conditions, the engineer of the Alaska Commercial Building, Mr. John Williams, decided that a storage battery installed would relieve the same and after thoroughly investigating the subject awarded the contract to the Gould Storage Battery Company.

The storage battery installation consists of 116 cells type 0-511, having a capacity of 200 amperes for one hour at approximately 240 volts, together with a "Gould" C. E. M. F. regulating booster, three-unit set, having a maximum capacity of 600 amperes at 60 volts. The operation of this storage battery installation resulted in the following improvements in service:

1st—The fluctuations in load were equalized by the battery, the battery discharging when the load demand was heavy and charging when the heavy load fell off, thereby maintaining practically a constant load on the generators. This load is maintained constant within 5 per cent plus or minus; that is to say, if the regulation is set for 200 amperes, the maximum fluctuations in load on the generators would be between 190 and 210 amperes.

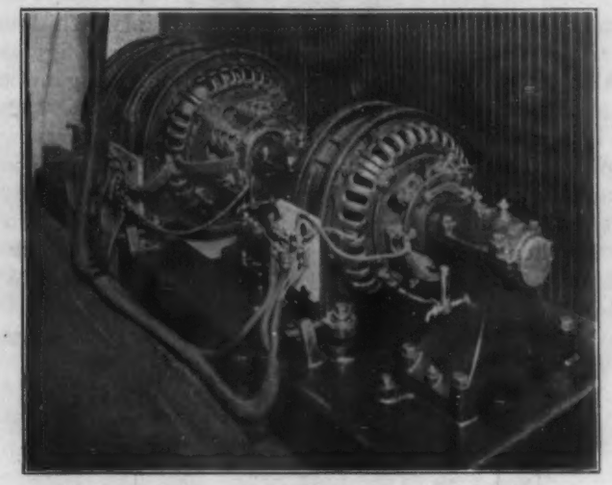
2d—Due to the load on the generators being maintained constant, it was found that the 75 kw. unit would carry the load during the greater part of the day, one of the larger units being necessary for lighting purposes, during winter only, for a few hours each day.

3d—As only one generator was required to be used and as the load was kept practically constant on this at the point of maximum efficiency, the oil consumption per kw. hour was very much reduced.

4th—On account of the ideal conditions under which the generators operated, the voltage regulation was absolutely perfect and no further complaints possible.

5th—The entire plant is shut down each night be-

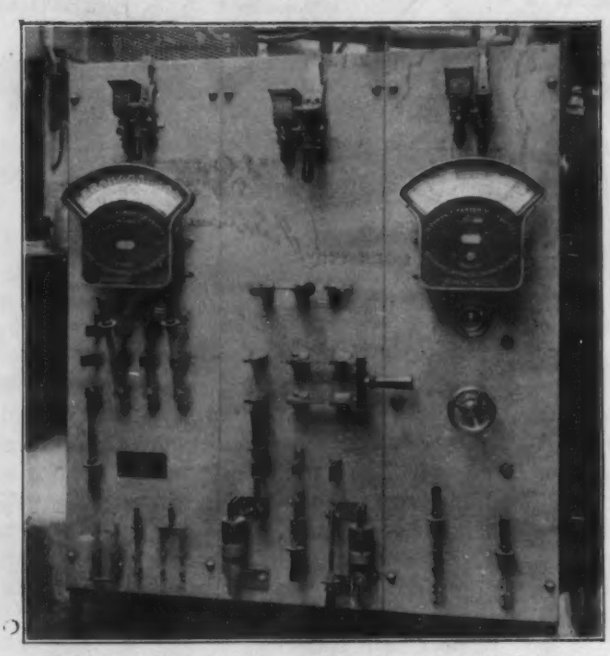
tween 10 p. m. and 7 a. m., the storage battery supplying the electricity necessary for the night run. In this way the cost of the electric service from the city supply was entirely eliminated.



Power Equipment Alaska Commercial Building.

6th—As the battery is discharged during the night and has to be charged the first thing in the morning, this gives a heavy load on the machine in the morning and furnishes abundance of exhaust steam for heating at the time it is most needed.

7th—After the heavy load goes off at about 6 o'clock in the evening, the completion of the charge of the battery to carry the night load supplies a full load to the generators until time to shut down, thus maintaining the high efficiency of the plant.



Switchboard Equipment, Alaska Commercial Building.

8th—In case of accident to the generator plant the battery will carry the entire load for about three quarters of an hour, giving ample time to put another generator set or boiler in service.

9th—Operating the plant by one generator unit alone, which the storage battery installation made possible, gives two units in reserve and makes shut downs of any duration impossible.

10th—By operating the generators under practically constant load, the shock of the fluctuations is removed and repairs reduced to a minimum.

11th—One of the greatest advantages of the installations is that due to the steady load on the entire plant it is possible to study the operating conditions of each part of the system under steady full load conditions and thus work out the maximum efficiency possible by tuning up the whole plant.

12th—Due to the improvements in efficiency and economy above set forth, a considerable saving in cash is effected each month and it is estimated that this saving will pay for the battery installation in three years' time.

This plant has now been in operation over a year and has satisfactorily met all the conditions imposed upon it. On one occasion it carried the load of the building, due to an accident in the engine for fifteen minutes while another generator was put in service.

MEDALS FOR CONDUCTORS.

The management of the Chicago & Milwaukee Electric Railroad, has decided to award a gold medal each month to the most efficient conductor in their service. E. H. Igou has received the first medal. The following high ideals of Mr. Igou were undoubtedly largely responsible for his attaining the distinction of being awarded the first decision:

"Passengers are patrons of your employer. Treat them as such. Help old women and women with babies or bundles on and off the car. Remember, where your regular passengers get off and don't haul them by. If old women or women with babies have no seat, ask some man to give them a seat. In rainy days open umbrellas for women as they get off. It saves accidents. Never give curt answers. If you're busy, wait to answer until you're through. Be as polite to homely women as to pretty women. Wait for passengers who are trying to catch the car. Keep your car clean and your patrons will help you."

TRAIN DISPATCHING BY TELEPHONE IN BRITISH COLUMBIA.

Of possible interest to American manufacturers of telephones is the report just published, quoting the superintendent of the Grand Trunk Railway telegraphs, W. W. Ashall, of Montreal, as stating that his company is about to adopt the telephone in place of the telegraph for train dispatching over its entire system, which is already extensive in British Columbia and is being rapidly added to in this Province, the main line to Prince Rupert being now under construction.

PHILIPPINE FRANCHISE AT PUBLIC AUCTION.

In regard to the disposition of the gas franchise for the city of Manila recently awarded the Bremen syndicate and forfeited by it on account of nonfulfillment of terms of the franchise, the Governor General has stated that the franchise will be put up at public auction if there are persons desiring to present bids.

QUICK CHECKS FOR ENGINEERING COMPUTATIONS.

It is a matter of considerable importance in making computations to know that we have done the same correctly. Very often engineers are called upon to make hasty calculations in a rather unfamiliar field and consequently errors creep in when attempting to substitute in various formulas. An error is very likely to occur in ordinary multiplication. A very simple rule to quickly test the accuracy is to sum up the digits in each number, and cast out the "nines" or multiples of nine appearing in each sum. Next multiply the remainders and again cast out the "nines" or multiples of nine. Now if you sum up the digits in your result you have found from multiplying your two original numbers and similarly cast out nines or multiples of nine, your two remainders should be identical, otherwise some mistake has been made.

Let us suppose for instance we desire to multiply 938 by 746. This operation is performed as follows:

938	(a) 20 or 2
746	(b) 17 or 8 (c) 16 or 7
5628	(e) 12 or 3
3752	(f) 8
6566	(g) 5
699,748	(d) 43 or 7

According to our rule set forth above, we find the sum of the digits in a to be 20, or casting out nines we have 2. The sum of the digits in b is 17, or casting out nines we have 8. Now multiplying this result in a and b together we have the result shown at c, which is 16, or casting out nines 7. Again adding the digits in d we have 43 and casting out nines obtain the result of 7. Since this is the same as appears at c our multiplication is evidently correct. Suppose these results are not the same and we desire to check each individual multiplication. By performing each individual casting out of nines in e, f and g this result in turn should correspond with 6 multiplied by a, 4 multiplied by a and 7 multiplied by a, or 3, 8 and 5 respectively. If the reader has never used this method, he can hardly realize how serviceable and quick this result is. By all means master it at once.

HONGKONG OIL IMPORTS.

Dominant American oil interests have announced their intention of increasing the world's consumption of oil by lowering the prices. This announcement had the effect of increasing the sale of the American product in the Far East. The imports of oil into Hongkong and the several tributary ports and territories—Canton, Amoy, Swatow, Foochow, Haifong, Saigon, Bangkok, and Philippine Islands—in 1910 were 89,104,000 gallons, against 76,351,000 gallons in 1909. The share of the United States in this trade was 51,440,000 gallons in 1910, and 44,200,000 in 1909. The imports of American oil into Hongkong in 1910 were 9,160,000 gallons.

ELECTRICAL OPERATION OF THE WEST JERSEY & SEASHORE RAILROAD.[1]

BY B. F. WOOD.

The proceedings of our engineering societies abound in papers and discussions on the merits of steam and electric operation of railroads in which data are used, which to a large extent are lacking in figures taken from the actual cost of operation. A general impression prevails that operating officers of railroads will not consent to the publication of their operating costs. This to some extent may be true, but where such figures are correctly understood and properly used there should be no objection to their publication.

When the question of presenting certain data pertaining to the operation of the electrical portion of the West Jersey & Seashore Railroad before the American Institute of Electrical Engineers was discussed

with the management of the Pennsylvania Railroad, the reply was made that not only would the information be furnished but that it would be a pleasure to have such information made public through the proceedings of the Institute. The following data were taken direct from the operating records with only such additions as would make them more readily understood. No effort has been made to curtail or to modify in any respect the data selected.

It is the object of this paper to present these data in as concrete form as possible without comparison with the operation of the parallel steam service, and no attempt will be made to analyze or compare the data with any that have heretofore been presented.

[1]Abstracted from a paper presented at the Twenty-eighth Annual Convention of the American Institute of Electrical Engineers, Chicago, Illinois, June 28, 1911.

This paper will be of value if railroad engineers are encouraged to present before the Institute similar data, and if some standard form for the compilation of such data is agreed upon. Comparisons could then be made more readily and their value enhanced.

It is hoped that a discussion will be developed which will enable operating officers and engineers to improve the efficiency, add to the reliability and reduce the costs of operation of electrically operated railroads.

The portion of the line which is electrically operated extends from Camden, via Newfield, to Atlantic City, a distance of 64.6 miles; and from Newfield to Millville, a distance of 10 miles. With the exception of the Millville Branch, which is a single track railroad, the line is double tracked with a third track extending for a distance of about six miles north from Woodbury.

This portion of the W. J. & S. R. R. was originally operated by steam and was a single track line south of Newfield. In the latter part of the year 1905 it was decided to electrify. The work was undertaken in December, 1905, and had progressed to such a point that in the early part of July, 1906, the first train was moved electrically. Regular operation by electric service was established in September of the same year.

The direct current over-running third-rail system operating at 675 volts was chosen for this installation.

A map of the West Jersey & Seashore Railroad is shown in Fig. 1, from which the electrified portion can be readily followed. The locations of the power station and the substations are shown, as well as the position of the transmission line with respect to the line of the railroad.

Cost of Construction.

A table is included showing the cost of construction in connection with the electrification and includes costs made necessary by electrification. It will be noted that the electrification costs represent less than half of the total cost involved in the change of motive power.

Costs are also presented showing the unit costs of power station transmission line, substations, etc.

COST OF CONSTRUCTION.

Power Stations:		
Building, stacks, coal and ash handling machinery	$354,000	
Equipment	640,900	
Total		$994,900
Transmission line		241,500
Substations:		
Buildings	72,000	
Total		491,560
Third rail		557,636
Overhead trolley		80,500
Track bonding		102,659
Cars		1,135,900
Car repair and inspection sheds		46,674
Right-of-way, additional		592,100
Reconstructing tracks		763,800
Constructing new tracks		2,071,000
Terminal facilities and changes at stations		252,400
Signals and interlocking plants		561,900
Changing telegraph and adding telephone facilities		105,100
Fencing right-of-way, cattle guards, etc.		88,400
Miscellaneous items		44,200
Total		$8,130,229

UNIT COST OF ELECTRIFICATION.

Power station, cost per kw	$ 124.36
Transmission line, cost per mile	3,485.00
Substations, building and equipment cost per kw	28.90
Third rail, cost per mile	4,235.00
Overhead trolley, cost per mile	4,120.00
Track bonding, cost per mile	684.50
Cars, including electrical equipment each	12,214.00

Cost of Operation and Maintenance.

The cost of operation and maintenance is shown under several headings as follows:

1. Cost of operation in cents per car mile.
2. Cost of operation and maintenance of Westville power station.
3. Cost of maintenance of high-tension transmission line.
4. Cost of operation and maintenance of substations.
5. Cost of maintenance of third rail.
6. Cost of maintenance of trolley.
7. Cost of maintenance of bonding.

TABLE I
WEST JERSEY & SEASHORE RAILROAD
Electric train service
Passenger train statistics
Cost of operation in cents per car mile

	Repairs, Electric Equipment of Cars.	Repairs Passenger Cars.	Other Maintenance of Equipment Costs.	Electric Power at Car Sheds.	Yard Service Shifting Costs	Motormen	Trainmen.	Train Supplies and Expenses.	Total.	Other Expenses	Total Expenses.	Car Miles, Total.	Average Cars per Train.
Year 1909													
January	1.06	2.05	0.48	4.78	0.51	0.93	1.53	1.20	12.53	10.25	22.78	279,210	3.113
February	1.07	2.42	0.38	4.63	0.51	0.91	1.49	1.22	12.63	10.99	23.62	258,130	3.163
March	1.18	1.97	0.35	4.99	0.52	0.99	1.65	1.18	12.83	10.17	23.00	279,193	3.092
April	1.26	2.03	0.25	4.43	0.46	0.89	1.40	0.61	11.32	9.14	20.46	317,963	3.483
May	0.84	1.73	0.26	3.98	0.44	0.88	1.45	0.45	10.03	9.18	19.21	318,006	3.482
June	0.40	0.68	0.31	3.58	0.25	0.86	1.41	0.42	7.91	9.35	17.26	339,294	3.530
July	0.33	0.44	0.12	2.82	0.20	0.80	1.25	0.40	6.36	6.95	13.31	478,203	3.669
August	0.28	0.40	0.14	2.75	0.20	0.75	1.18	0.36	6.06	6.29	12.35	517,223	3.921
September	0.43	0.67	0.14	2.75	0.25	0.83	1.32	0.42	6.81	6.87	13.68	428,571	3.584
October	0.64	0.71	0.24	3.84	0.31	0.92	1.53	0.62	8.81	10.21	19.02	307,825	3.046
November	0.52	0.39	0.29	3.85	0.29	0.95	1.70	0.82	8.81	9.30	18.15	291,816	3.327
December	0.87	1.08	0.29	12.31	0.30	1.00	1.72	1.30	18.87	15.05	33.92	292,175	3.318
Avg	0.68	1.10	0.25	4.30	0.33	0.88	1.44	0.69	9.67	9.08	18.75	4,107,609	3.457
Year 1910													
January	0.86	1.03	0.67	4.59	0.46	0.96	1.64	2.24	12.45	7.22	19.67	292,523	3.169
February	0.79	1.78	0.33	5.38	0.50	0.97	1.48	1.07	12.30	12.44	24.74	262,488	3.137
March	1.04	1.13	0.28	3.87	0.48	0.88	1.51	0.89	10.08	12.91	22.99	333,252	3.445
April	0.62	0.76	0.31	4.57	0.49	0.97	1.62	0.70	10.04	11.55	21.59	302,463	3.344
May	0.57	0.78	0.24	2.78	0.48	0.89	1.41	0.44	7.59	9.92	17.51	351,994	3.651
June	0.79	0.67	0.24	2.80	0.45	0.97	1.62	0.58	8.12	10.13	18.25	375,023	3.406
July	0.44	0.46	0.18	2.47	0.34	0.89	1.39	0.36	6.53	6.66	13.19	565,787	3.641
August	0.29	0.57	0.15	2.48	0.33	0.85	1.38	0.37	6.42	5.62	12.04	594,852	3.811
September	0.37	0.54	0.21	2.71	0.39	0.85	1.42	0.42	6.91	7.34	14.25	487,543	3.771
October	0.73	1.19	0.28	3.05	0.47	0.91	1.69	0.52	8.84	12.34	21.18	339,789	3.564
November	1.40	2.45	0.47	3.71	0.51	0.96	1.71	0.54	11.75	10.58	22.33	311,882	3.379
December	0.63	1.94	0.21	3.93	0.51	0.93	1.71	0.74	10.60	12.13	22.73	334,936	3.494
Avg	0.66	1.01	0.27	3.33	0.43	0.91	1.52	0.67	8.80	9.39	18.19	4,552,532	3.518

Table I shows the cost of operation for the years 1909 and 1910, in cents per car mile, and subdivides the cost of operation into the general headings, repairs, electric equipment of cars; repairs, passenger cars; other maintenance of equipment costs; electric power at car shops; yard service, shifting cost; motormen; trainmen; train supplies and expenses; total of above; other expenses; total expenses. The table also shows the total car miles per month and the average cars per train. The headings of this statement are probably sufficiently explanatory, other than "other expenses," which includes cost of maintenance of way and structures, despatching trains, telephone and telegraph, crossing gatemen, together with traffic expenses and general expenses.

Table II shows the cost of operation and maintenance of the Westville power station for the year 1910. This statement is subdivided under the general headings of operation and maintenance and under the further sub-headings of material and labor. The statement shows the total monthly cost as well as the cost in cents per kw.-hr. for each item.

The total net output from the station is also shown as well as the pounds of coal per kw.-hr. and the cost of coal per ton of 2000 lb.

TABLE II
WEST JERSEY AND SEASHORE RAILROAD
ELECTRIC TRAIN SERVICE
COST OF OPERATION AND MAINTENANCE OF WESTVILLE POWER STATION
YEAR 1910

	Items	January		February		March		April		May		June		July		August		September		October		November		December		Year	
		Total	Cents per kw-hr.	Total	Cents per kw-hr.	Total	Cents per kw-hr.	Total	Cents per kw-hr.	Total	Cents per kw-hr.	Total	Cents per kw-hr.	Total	Cents per kw-hr.	Total	Cents per kw-hr.	Total	Cents per kw-hr.	Total	Cents per kw-hr.	Total	Cents per kw-hr.	Total	Cents per kw-hr.	Total	Cents per kw-hr.
OPERATION	Labor: Boiler room	1,089.73	0.000	1,073.82	0.000	1,183.75	0.033	1,289.59	0.064	1,189.45	0.068	1,167.23	0.068	1,214.16	0.047	1,268.02	0.045	1,219.78	0.051	1,239.95	0.056	1,254.90	0.052	1,282.06	0.047	14,748.26	0.049
	Turbine	603.89	0.033	809.55	0.043	771.85	0.036	858.21	0.041	854.09	0.040	785.88	0.037	827.18	0.031	855.69	0.029	898.52	0.033	886.00	0.039	881.18	0.036	943.43	0.031	10,010.81	0.035
	Electrical	133.69	0.004	135.18	0.007	131.83	0.006	140.27	0.007	142.71	0.007	128.75	0.006	141.89	0.005	138.10	0.004	135.46	0.005	139.48	0.006	140.89	0.006	142.97	0.005	1,661.02	0.005
	Supervision janitors and watchmen	431.09	0.000	388.86	0.021	371.13	0.017	388.13	0.009	180.83	0.008	184.15	0.007	171.67	0.006	178.30	0.007	179.14	0.008	185.53	0.007	188.20	0.006	2,786.23	0.010
	Total operating labor	2,458.10	0.114	2,404.51	0.129	2,478.24	0.112	2,446.20	0.121	2,355.07	0.111	2,266.00	0.105	2,404.83	0.090	2,551.48	0.083	2,483.66	0.096	2,434.63	0.109	2,443.35	0.100	2,170.43	0.103
	Material: Coal	7,725.33	0.363	7,099.39	0.378	7,789.57	0.355	7,169.63	0.353	7,273.21	0.358	6,383.56	0.301	9,949.62	0.394	10,578.06	0.345	9,982.80	0.370	7,800.96	0.355	8,770.26	0.368	10,463.23	0.379	103,715.31	0.383
	Water	41.67	0.002	41.67	0.003	41.66	0.002	41.67	0.002	41.66	0.002	41.63	0.002	41.67	0.001	41.68	0.001	41.68	0.002	41.68	0.002	41.66	0.002	41.65	0.002	500.00	0.002
	Lubricants							40.73	0.002	38.27	0.002	47.37	0.002	101.21	0.003	35.74	0.001	35.63	0.001	40.05	0.001	75.92	0.003				
	Misc. material	394.68	0.010	121.51	0.007	294.71	0.011	137.25	0.007	75.39	0.004	78.23	0.004	147.63	0.005	131.53	0.004	187.30	0.007	189.71	0.008	158.61	0.007	208.25	0.007	2,238.44	0.007
	Misc. charges	123.10	0.003	120.98	0.008	113.49	0.005	116.80	0.005	144.49	0.007	173.80	0.008	124.60	0.004	213.96	0.007	230.77	0.009	127.00	0.006	117.33	0.005	96.35	0.003	1,700.49	0.006
	Total operating material	8,284.73	0.380	7,333.34	0.393	8,138.36	0.370	7,465.34	0.367	7,577.45	0.373	6,884.01	0.307	10,210.23	0.388	11,000.98	0.339	10,058.36	0.389	8,093.96	0.373	9,156.33	0.383	10,985.99	0.394	107,154.34	0.378
	Total operation	10,332.82	0.494	9,737.85	0.522	10,566.60	0.488	9,911.54	0.488	10,223.63	0.484	10,050.01	0.393	13,705.70	0.488	13,812.36	0.441	12,537.04	0.485	10,707.29	0.481	11,519.69	0.484	13,234.24	0.483	130,324.66	0.481
MAINTENANCE	Labor: Building	13.04	0.001	4.91	0.000	4.41	0.000	67.21	0.003	45.30	0.002	31.89	0.001	8.08	0.000	.14.02	0.000	46.30	0.002	30.54	0.001	37.55	0.002	31.15	0.001	339.39	0.001
	Boiler room	79.87	0.004	148.85	0.009	191.89	0.009	220.67	0.011	188.26	0.009	82.21	0.004	104.33	0.004	127.66	0.004	139.76	0.005	97.90	0.004	121.98	0.005	86.71	0.003	1,550.44	0.005
	Turbine	33.13	0.001	48.46	0.003	118.85	0.005	39.68	0.001	29.64	0.001	97.10	0.004	52.75	0.002	10.96	0.000	22.57	0.001	51.40	0.003	47.35	0.003	294.22	0.011	538.11	0.003
	Auxiliary apparatus	39.74	0.002	43.22	0.003	33.71	0.003	31.44	0.001	33.23	0.002	189.25	0.009	84.34	0.003	174.39	0.006	49.30	0.002	22.06	0.001	134.80	0.006	8.74	0.000	944.17	0.003
	Electrical	0.86	0.000	4.85	0.000	13.67	0.001	15.93	0.001			15.46	0.001	72.66	0.003	26.21	0.001	21.23	0.001	4.47	0.000	10.15	0.000	6.69	0.000	195.30	0.001
	Piping	35.74	0.001	39.47	0.002	48.03	0.003	72.52	0.004	72.33	0.003	70.53	0.003	66.10	0.003	73.10	0.003	52.34	0.002	57.25	0.003	57.07	0.002	44.76	0.002	691.34	0.002
	Miscellaneous	26.49	0.001					13.66	0.001	34.11	0.002	65.84	0.003					20.96	0.001	18.53	0.001					187.20	0.001
	Total maintenance labor	227.37	0.011	289.71	0.016	410.46	0.019	492.60	0.022	372.76	0.018	552.56	0.025	391.18	0.014	428.31	0.014	354.35	0.014	283.74	0.013	408.90	0.017	482.20	0.017	4,831.55	0.016
	Material: Building	8.26	0.000	3.63	0.000	10.76	0.001	42.01	0.002	44.62	0.003	13.51	0.001	1.74	0.000	1.71	0.000	10.87	0.000			5.17	0.000	3.75	0.000	146.83	0.001
	Boiler room	165.63	0.007	204.04	0.018	240.03	0.012	231.07	0.011	89.60	0.004	190.02	0.009	66.01	0.003	100.73	0.004	148.03	0.006	346.11	0.025	170.34	0.007	235.14	0.009	2,465.23	0.009
	Turbine	3.19	0.000	125.41	0.007	263.53	0.017	440.23	0.022	88.04	0.004	25.15	0.001	24.05	0.001	76.88	0.002	67.26	0.002	261.11	0.018	3.06	0.001	14.29	0.000	1,297.30	0.000
	Auxiliary apparatus	20.35	0.001	144.10	0.008	43.20	0.002	36.26	0.003	67.66	0.003	264.33	0.012	3.76	0.000	1,232.28	0.043	22.99	0.001	23.81	0.001	10.48	0.001	67.26	0.003	2,066.13	0.007
	Electrical	0.00	0.000	0.74	0.000	4.86	0.000			3.13	0.000	83.79	0.004	2,934.13	0.103	0.85	0.000	13.03	0.000	6.74	0.000	0.14	0.000	8.80	0.000	3,048.44	0.011
	Piping	9.94	0.001	21.97	0.001	21.81	0.001	22.29	0.003	12.15	0.001	43.66	0.002	9.74	0.000	10.98	0.000	40.92	0.002	106.49	0.006	24.73	0.001	21.45	0.001	383.97	0.001
	Miscellaneous			53.97	0.003	49.21	0.002	40.67	0.002			87.87	0.004	84.48	0.003									283.80	0.010	880.06	0.002
	Total maintenance material	195.96	0.009	682.86	0.035	733.46	0.033	864.53	0.043	305.10	0.014	714.22	0.033	3,103.34	0.113	1,332.39	0.048	302.30	0.011	1,049.36	0.047	227.94	0.010	634.40	0.023	10,332.93	0.037
	Total maintenance	423.33	0.020	972.57	0.051	1,143.92	0.054	1,357.13	0.065	679.26	0.032	1,266.80	0.058	3,494.52	0.125	1,760.70	0.063	656.65	0.025	1,319.90	0.059	638.83	0.027	1,096.80	0.045	14,964.82	0.053
SUMMARY	Total labor	2,675.47	0.125	2,694.23	0.145	2,888.70	0.131	2,938.40	0.143	2,729.73	0.129	2,818.56	0.130	2,896.00	0.104	2,979.79	0.097	2,837.35	0.110	2,684.37	0.121	2,852.45	0.116	2,810.75	0.108	28,801.97	0.110
	Total material	8,385.70	0.389	7,966.20	0.428	8,910.83	0.411	8,329.87	0.410	8,152.95	0.387	9,305.23	0.430	13,314.23	0.478	13,599.27	0.477	10,360.66	0.400	9,331.92	0.419	9,354.07	0.385	11,580.39	0.417	117,487.23	0.415
	Total labor and material station proper	10,984.17	0.514	10,660.43	0.573	11,799.53	0.543	11,268.27	0.553	10,882.68	0.516	12,146.81	0.560	16,300.23	0.583	16,579.06	0.574	13,213.99	0.510	12,016.29	0.540	12,156.52	0.511	14,431.14	0.525	151,389.19	0.534
	Other items charged to station accounts	143.53	0.007	144.86	0.007	127.53	0.006	152.63	0.009	197.92	0.009	174.49	0.008	190.86	0.007	199.84	0.007	184.06	0.007	182.65	0.008	190.53	0.008	213.37	0.008	2,160.60	0.008
	Total	11,108.00	0.521	10,835.29	0.580	11,927.35	0.549	11,421.39	0.562	11,110.30	0.525	12,321.30	0.568	16,390.10	0.589	16,778.90	0.581	13,397.65	0.517	12,198.94	0.548	12,346.04	0.519	14,644.51	0.531	153,549.79	0.542
	Net output	2,131,000		1,865,300		2,168,000		2,031,400		2,115,900		2,167,200		2,794,300		3,088,300		2,590,400		2,329,000		2,561,800		2,709,300		28,312,900	
	Lbs. coal per kw-hr	2.311		3.46		2.27		3.223		3.289		2.14		3.16		3.668		3.395		3.165		3.968		3.266		3.246	
	Cost of coal per 2000 lbs	$2.19		$2.19		$2.19		$2.19		$2.19		$2.43		$2.24		$2.24		$2.24		$2.24		$2.24		$2.24		$2.239	

An improvement will be noted in the reduction of cost of power, as well as a reduction in coal consumption per kilowatt hour. The most marked improvement, however, will be noted in efficiency of transmission and conversion, which is accounted for by the fact that the operation of the substations is followed up with care so as to minimize the idle operation of rotaries.

OIL ENGINES FOR SHIPS.

Of much interest to the West in general, and California in particular, is the rapid growth in the use of oil for ocean-going vessels. The prediction is made that this year will show a very great advance in the use of oil engines as the motive power for ocean-going vessels. A recent writer on this subject has stated that it is not improbable that within the next two or three years ships without funnels or boilers will be making regular passages across the Atlantic.

The continent, however, and not Great Britain, has taken the initiative thus far in this important matter. Only one vessel of size to be equipped with oil engines is at present being built for registration under the British flag, although it is stated that a London firm of shipowners is about to place an order for a vessel of about 6000 tons.

Two vessels to be fitted with oil engines are being built for the Danish East Asiatic Co., while a 9000 ton motor boat is nearing completion for the Hamburg-American Line, and two oil liners are under contract for the Brazil service of the Hamburg-South Ameican Co. A five-masted bark of 3272 tons burden is building at Bordeaux, which will be provided with internal-combustion engines.

The desirability of the employment of such engines for the propulsion of large vessels was the subject of discussion not long ago at a meeting of the British Institution of Naval Architects in London. One speaker said that he knew of 250 ships which were fitted or to be fitted with Diesel plants. The most important field as yet had been that of submarines, in which France took the lead seven or eight years ago. To-day the engine was almost universally adopted for that kind of ship by the admiralties of all countries except England and the United States. The number of such submarine boats was about 150, and their horsepower varied from 300 to 5000. In the last two years the radius of action and the power of those boats had so increased that the vessels were no longer merely defensive boats attached to harbors and coasts, but had become extremely dangerous for offensive purposes on the high seas. A number of gunboats and very small cruisers, especially for Russia, had been fitted with the engines. The second important field was that of the tank boats for the transport of oil in Russia. Among various other types of boats in which the engine was used was a special vessel for an expedition to the North Pole.

A department of electricity is planned for Manila, the new department to have charge of the electric lighting of the city, police and fire alarm systems, electrical installation and repair work, and meter testing.

WESTERN RED CEDAR.[1]

BY WM. L. HALL AND HU MAXWELL.

Dry Western red cedar has a weight of 23.7 pounds per cubic foot, a specific gravity of 0.38, an ash of 0.17 per cent of dry weight of wood, a fuel value of 51 per cent of white oak, a breaking strength of 10,500 pounds per square inch.

In character and qualities it is light, soft, not strong, brittle; grain coarse, even, and straight, compact; annual rings rather wide and even; summerwood about half the width of the ring, dark colored, hard distinct, medullary rays numerous, obscure; color dull brown, tinged with red, the thin sapwood nearly white; easily worked; durable in positions exposed to decay.

Its growth varies in height from 100 to 150 feet, exceptional trees 200; diameter 3 to 8, extreme 16 feet.

The western red cedar grows in sufficient abundance over an area of 300,000 square miles to make it attractive to lumbermen. This region embraces portions of northern California, Oregon, Washington, Idaho, British Columbia, and Alaska, The principal cut has been reported from Washington, and that State may be considered as the center of supply. The best timber comes from regions of abundant rainfall and mild humid climate. Near the species' southern limit in California it clings to the fog belts. Its extensive range and the fact that it does not usually occur in pure stands of large extent make estimates of the total available supply difficult. It is certain that cutting in late years has been more rapid than growth, but it is not known how long, at the present rate of cutting, the timber will last. It is not believed, however, that the end will arrive in the near future, although the drain upon the forests is very heavy, and has been for years.

Nature made ample provision for the spread of the species. The light seeds are fairly abundant, and having two wings, they are great travelers and search out favorable situations for germination and growth. Forest fires are the tree's worst enemy. The bark is thin, and a brisk blaze, though of only short duration, is usually sufficient to kill mature timber, while small growth seldom escapes. After the fire has passed, if it has burned the humus in the soil sufficiently to lessen its capacity to retain moisture, the seeds of this tree do not readily germinate. For that reason the tree seldom follows fires, as lodgepole pine does in the West and paper birch in the East. Under normal conditions western red cedar is not exacting in its requirements. It grows in dense shade, and lumbermen cut much excellent timber in deep forests; but shade is not essential, and good lumber comes from tracts where other growth is thin and light is abundant.

It is not so essential in the case of western red cedar as with some other timbers that the trees be cut when they reach merchantable size. They will stand a long time after that before deteriorating. Trunks in good condition at the age of 600 or 800 years have been reported, but the majority of fully matured trees are not so old. Claims of ages 1,500 years or more have been made, but have not been

[1] Abstracted from Forest Service Bulletin 95, U. S. Dept. of Agriculture.

fully substantiated. It is well known, however, that trunks that fell in damp woods centuries ago have lain beneath moss and soil until the present day in a sound condition. Timber of this kind figures to a limited extent in the lumber supply. Logs dug from swamps, or exposed to view when the moss and humus have been burned off, are sometimes manufactured into shingles or lumber. Cases are vouched for in which the ages of trees growing upon buried logs show that the prostrate trunks fell five or six centuries ago, and even more, and though they have lain so great a period they are found fit for merchantable lumber.

The Indians made much use of western red cedar before white men became acquainted with the region in which it grew. From it they obtained food, clothing, shelter, means of transportation, and apparatus for fishing and the chase. From the tree trunks the savages made canoes of all sizes, from the small trough that carried two men to the enormous dugouts that transported 50 or more upon long expeditions in war and peace. Before the Indians obtained metal tools from white traders they hollowed their canoes with fire and with their primitive stone and bone implements. Some of their dugouts are of enormous size, hewed from single trunks, and with lines so perfect that civilized men can scarcely suggest improvement.[1] The making of a canoe of moderate size, by the crude means at the Indians' command in the early days, required several months of hard labor with flint adzes that chipped away pieces of wood not much larger than grains of sawdust,

When Lewis and Clark crossed the Rocky Mountains and reached the tributary waters of the Columbia River in the summer of 1805, they saw for the first time the canoes of the Indians made of this wood. Some months later when the explorers found it necessary to abandon their pack animals and trust to the rivers to carry them to the Pacific, they made their canoes of cedar, and the small fleet successfully descended the Columbia and carried the explorers to the ocean. So common was the use of this wood for dugouts that with many persons its only name was canoe cedar.

The Indians nearly always made their totem poles of this wood, because it is soft and they could work it easily with their rude tools. It was valued likewise because it resisted decay a long time, and when the grotesquely carved pole had once been set up in the village or at the cemetery, it could be reasonably expected to stand at least during the lives of those who made it and set it up. Some of these gigantic trunks hewed in forms of men and beasts, often with considerable skill, are the largest pieces of single wood carving in the world, greatly exceeding in size the largest columns and doors of European cathedrals.

The Indians of the region where western red cedar abounded generally chose it for such rude carpentry as they were capable of doing. Their choice was due to the softness of the wood, which meant a great deal to men who hewed and shaped their beams and doors with no better tools than fire, flint, bone, and shell. They made fully as much use of the bark as of the wood. With it they roofed, ceiled, floored, and papered their huts. They wove long strips of bark—sometimes 30 feet in length—into mats, which they used for beds, tables, blankets, and on ceremonial occasions. They made clothing of the same material. They twisted the bark into ropes for dog harness, ladders, fishlines, and snares for wild animals and nets for catching fish. The list of uses for the bark did not end there, for they were able to make food of it. They beat the bark to a pulp, baked it in cakes, and after completely saturating it with salmon oil they pronounced it a palatable and nutritious article of diet. It is believed, however, that the food value of the cakes was derived more from the fish oil than from the bark.

The first white settlers in the region adopted many uses of this wood from the Indian, but the chief was for canoes. What the yellow poplar was as a canoe wood to the early settlers in the East the western red cedar was to the frontiersman and trader in the Pacific region from Alaska southward.

Its value for shingles was early discovered, and as soon as the cabin took the place of the woods camp the shingle roof put in an appearance. The doors and window frames, as well as joists and rafters, were frequently of the same material. The wood's softness had tempted the Indians to use it, and the same property appealed to the white men who succeeded the Indian as the possessor of the country. It was one of the first woods cut for fences, and for many years it was commonly so used wherever it was within reach. It was employed for rails and for posts, and its long resistance to decay is shown by the fact that some of the fences built nearly half a century ago were doing service until very recently.

In the days when cooperage was handwork on the Pacific Coast, and tubs and pails were made in each neighborhood, the cedar was one of the choice woods, because convenient, easy to work, handsome in appearance, and serviceable for many years.

Western red cedar is the greatest shingle wood in the United States at this time, and has held that place for some years, with no likelihood of giving it up in the near future. The average output from this wood alone, and chiefly in the State of Washington, is not far short of 20,000,000 shingles for every day in the year. In 1908 it furnished 63 per cent of the total shingle cut of the United States. Redwood shingles, made only in California, appear with it in the eastern markets, but they form only one-eighth of the cedar output.

This cedar is extensively cut for poles in Washington and Idaho, and large size poles of this wood are now shipped to nearly all parts of the United States under the name of Idaho cedar. The very long poles seen in city streets are generally of this wood,

[1] It is claimed that canoes made by the Alaska and British Columbia Indians were early taken by fur traders to Boston and New York, where they became the patterns by which the celebrated clipper ships were built. One of the canoes, now in the National Museum in Washington, is 59 feet long, 8 feet beam, 7 feet 2 inches deep at bow, 5 feet 3 inches at stern, and 3 feet 7 inches in the middle. It was made on Vancouver Island with Indian tools, and is capable of carrying 100 persons with their camp outfits. The canoe is 19 feet longer than the Sparrow Hawk, which brought settlers from England to America in 1626. It is said that even larger canoes have been hewed from single trunks of western red cedar. A flare is given the large canoes after the hewing is done, and the width of the beam is increased 8 to 12 inches. The canoe is filled with water which is brought to a boil by dropping in hot stones. When the wood is softened by the heat, the flare is given by inserting braces.

because other woods do not afford the necessary length. Poles cut from this species taper regularly, and present an attractive appearance when set in line. Their ability to resist decay likewise adds to their value along streets and suburban roads where frequent resetting through cement and asphalt is expensive. Country telephone poles are from 20 to 30 feet long, railway telegraph poles from 25 to 40 feet, and those in cities from 40 to 75 feet.

The wood is used for car siding and roofing, positions where great strength is not required.

More is now used in boat building than in the days of the Indian canoes on western waters, but it serves in a different way. It is now a highly finished product, and is worked by skiff makers and yacht carpenters. It provides handsome trim, lining, railing and roofs.

It finds more and more demand as interior finish for houses, stores, and offices. Pattern makers use it, and it is seen in window and door frames, and in sash and doors, in molding, chair boards, stairways, panels, and porch work. It fulfills the requirements of outside finish as well as inside, and is being cut into bevel-edge siding in large quantities in many western mills. Cabinetmakers use it for many purposes—the backs and sides of drawers, shelves, boxes, and partitions. It is worked into frames and sash for hothouses, as well as sash for ordinary windows.

Its use in cooperage has come down to the present time, and where it was formerly shaped by hand it is now manufactured by machinery into buckets, pails, tubs, tanks, and the whole line of similar articles.

PUBLIC-ROAD BUILDING IN CANADIAN ROCKIES.

BY FRANK C. DENISON.

The public-road system of the Canadian Rockies is similar to that under which the roads of the Province of British Columbia are administered and is under the direction of the minister of public works in the provincial government.

Up to two years ago there was no systematic road building with a completed system of roads for the district as an ultimate object. Roads were built where temporary demands called for them, and thus some of the moneys appropriated for such purposes were not used to the best advantage. Two years ago the government at Victoria determined upon a more systematic plan, and in 1910 $65,000 was set aside for road construction in the Fernie Riding, which was found inadequate and the account was slightly overdrawn in order to complete the work laid out for that year. For the current year there has been set aside $85,000. A portion of this money is used to improve the existing roads, but the larger part is for building a 75-mile east and west trunk road from the western boundary of the riding at Wardner, on the Kootenay River, to the Alberta provincial boundary line at the summit of the Rocky Mountains, in the Crows Nest Pass, where it connects with the public-road system of Alberta. A north and south road, starting at the international boundary, at Gateway, on the east bank of the Kootenay River, and running northerly to an intersection with the east and west trunk line near the Kootenay River at Wardner, is also being improved and extended. This north and south road intersects with a good road already in use, which extends up the valley of the Kootenay River and down the Columbia River to Golden, on the main line of the Canadian Pacific Railway, where that road crosses the Columbia River.

In addition to the amounts mentioned, $15,000 has been appropriated to extend a wagon road from Corbin, the terminus of the Eastern British Columbia Railway, near the summit of the main range of the Rocky Mountains, in a southerly direction to the international boundary, on the Flathead River, where a highway from Beaton, Mont., touches the boundary line.

All bridge work in the district is done with appropriations made independently of sums voted for road work, and a considerable sum has been spent upon this class of public improvement. The latest and most expensive bridge that has been constructed in the Fernie Riding is that crossing the Elk River near where it discharges into the Kootenay, about 30 miles south of Fernie; it has spans 144 feet in length.

The trunk line of road being constructed through the district from east to west is being kept within an 8 per cent grade, and even this is to be reduced to a standard 5 per cent as the work is completed. This trunk line is but one link in a through road which is being constructed from the coast in the west to the Alberta line in the east. Another trunk line is projected from some point on the Canadian Pacific Railway, east of the Rocky Mountains, to some point on the road already built up the Kootenay and down the Columbia Rivers, which is designed to form a loop line through the mountains, which will be of sufficiently easy grade for automobile travel.

All the roads mentioned herein are intended to be so constructed when completed as to permit of automobile travel and to become a part of a provincial road system. The roads in the western part of this district, which has been longer settled, are cared for and controlled by the same system.

ILLUMINATION OF TRIPOLI.

According to consular reports, Tripoli is a city of about 40,000.

Petroleum lamps are used by everybody and quite recently the American lamp has entered the market and promises to outbid all competitors. Petroleum to the value of $25,000 is sold annually, it being the American product wholly. There is little demand for gasoline, which is used only for motor purposes. It sells at 15 francs per case of 36 liters (30 cents per gallon).

Until last May the street lighting had been very unsatisfactory, as ordinary kerosene lamps were used, but recently a German agent doing business in Tripoli persuaded the city authorities to install about 25 street lamps in the principal streets and squares. This system is called Autolux, and is manufactured by the Aktiebolaget Lux of Stockholm, Sweden. The cost of each lamp c. i. f. Hamburg is $35.46 and $34.11 for a 1,000 and 500 candlepower light, respectively.

Tripoli was treated to a rare sight the second week of June by the illumination of the Italian flour mill. An English electric plant has been installed in this up-to-date establishment.

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POWER AND GAS

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Changes of advertising copy should reach this office *ten days in advance of date of issue.* New advertisements will be accepted up to noon of Monday dated Saturday of the same week. Where proof is to be returned for approval, Eastern advertisers should mail copy at least thirty days in advance of date of issue.

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FOUNDED 1887 AS THE
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Educational Value of the Journal

A great deal is being written in the technical press of the country of late about depreciation. We want to say a little about appreciation.

Nearly twenty-five years ago this Journal first breathed the breath of life under the name of Pacific Lumberman, Contractor and Electrician. No bed of roses was ever strewn for it in these years of struggle for existence. Its rugged hard-earned battle has won for it a place in the heart of the West peculiarly its own. Having passed through all the trials and troubles incident to infancy and early manhood, the crisis of its life came in its nineteenth year as a result of the great San Francisco disaster. Everything belonging to the Journal was burned and almost completely destroyed by the great fire. The inventory of assets taken a few days after the calamity of 1906, showed but little aside from a good name earned by nineteen years of hard work. It was typical of that spirit of the West, of which all true westerners are justly proud, that immediately after the fire, its supporters decided that the Journal should not die. Far from it, the engineers of the west flocked to its support and not only was it decided to continue its existence but to quadruple its publication. During the immediate weeks following the fire, consequently, the Journal appeared as a weekly instead of a monthly and has so appeared since that time. In those dark days following the great disaster, never in its history did the Journal feel so deeply its hold upon its supporters. The silent, but meaning glances of approval over its brave struggle shown on all sides are never to be forgotten.

The Journal has steadily grown. Its influence has extended from a mere local field until now we feel justly proud of the whole-hearted support we are receiving from the Rockies to the Pacific. But it is not enough that our columns, through its thousands of readers, reach the buyers of 90 per cent of the power apparatus and supplies sold in the West. We want to feel that its influence as a technical educator is each day extending more widely in area and more deeply into the hearts of its readers. We appreciate the whole-hearted and almost unanimous support we have received from the managers of the big power plants and engineering concerns in the West. We want to show our appreciation by now extending our influence to reach more of their subordinates. We want to add our mite toward raising the plane of efficiency of the underman. The Journal at an early date is contemplating running a series of technical articles by men actively engaged in teaching in our great Western universities, covering such subjects as will be best adapted to the needs of Western engineers in embryo. If these articles call forth a good healthy discussion, a more earnest desire among young engineers to seek the truth in their chosen profession, we shall feel that our purpose has been accomplished.

Technical writing, like Portia's quality of mercy, "is not strained; it blesseth him that gives and him that takes."

Technical Writing

The ethics of an engineer is such that he cannot consistently advertise himself by the usual display advertisement used in the trades, nor can he solicit business in the usual methods employed in commerce. His name, his reputation, what he has formerly accomplished, must be the sole factors to secure his aggrandizement. No truer saying was ever laid down than the biblical quotation, "By their fruits shall ye judge them." The only legitimate way then, by which an engineer with proper deference to the ethics of his profession can advertise himself, is to see to it that his structures and methods become known to his fellows. In this sense technical writing blesses him that gives. Go to any engineer of reputation and he will tell you of his first start in the engineering world. He will tell you how he struggled year after year, painstakingly and often heartily discouraged till finally through some publication, his works became known and his ability appreciated.

On the other hand every engineer is a debtor to his profession. Thousands of young engineers are growing up around us who will soon have to bear the burdens of the engineering world. The experience of the older brother is of untold service in giving the younger brother a lift in life. In this latter sense technical writing blesses him that takes.

Too often when requested to write for publication, the young engineer, especially, gives a negative answer due to his belief that he lacks facility in written expression. To him the Journal wishes to make one suggestion. Go into a quiet room for a few minutes, close your eyes, think of the engineering subject in which you are intensely interested, pick up your pencil, write as you think and read the result later. You will be interestingly surprised. You will see ideas, developments, constructive imaginaion which have been carried in your mind for years, but heretofore thought by you incapable of expression.

The Journal appeals to Western engineers to submit their contributions to it for publication. The loyal and earnest support given it in the past has been the greatest factor in its present material growth. Expansion and high standard of quality are our early ambition. Hand in hand our Western development must take place. The engineer conceives new ideas. These ideas are transformed either into more efficient engineering structure or more economic methods of handling the great enterprises of the West. Our engineers then put into writing what has been accomplished and our younger men struggling along the road to learning, which philosophers of old have reminded us "is not a royal highway," are enabled to grasp new ideas and accomplish still more ideal results. The Journal feels that to be this medium of transfer of ideas is to accomplish its highest aim and it yearns through their closer co-operation to be of still great efficiency to its Western brothers.

Central Station vs. Isolated Plant

In the design of an isolated plant "team work" of its several parts is the detail which should most of all be carefully considered. Each piece of apparatus most suitable for the conditions of service under which it is to operate must be most carefully designed, and all parts of the installation must be so proportioned as to produce maximum good results and efficiency. Good design of the isolated plant will take into account the slightest thing that would tend to modify these conditions. The storage battery, the subdivision of equipment, the estimate of the proposed load, the limitations of space; the limitations of equipment to standard makes, the nearness to public service supply, and a hundred other details must come in for careful review.

The central station supply, on the other hand, usually presents two arguments, which at times prove effective in crushing the life of the isolated plant. The one is cheaper power costs, and the other is continuity of service. If the two arguments can be thoroughly shown to apply in any particular case, beyond the question of a doubt, the isolated plant loses its only excuse for existence. Very seldom, however, can this be shown; consequently the battle ground of conditions varying between costs and continuity of supply is usually the scene of a very bitter conflict.

Elsewhere in these columns will be found typical descriptions of the isolated plant in operation and results accomplished when properly designed. Also will be found noted illustrations of recent cases in which the central station service has been adjudged so superior that it has been deemed best to abandon the isolated installation. In any particular case the factors that lead to the final judgment of the one over the other necessitate the consideration of many fine and delicate points. Convincing arguments for a choice in one case will be found wholly unapplicable in a second instance. As the struggle of the one against the other continues, the upholders of both sides, due to the constantly improving of equipment and generation of power, are enabled each day to provide new arguments for their views. The isolated plant of yesterday, inefficient, costly, and of low continuity factor is found by years of careful study and correct design to be remarkably cheap in operation and practically constant in service. The great central stations of yesterday, on the other hand, receiving their power supply from the hydroelectric plants miles from the center of distribution, were found poorly equipped for continuous service. Today, however, with their giant turbo-generator auxiliaries and network connections of the several supplies the service is ideal.

Day after day the struggle between the central station and the isolated plant continues. To the nonpartisan much good argument can be seen on both sides. The future alone can be the final judge. Like the great bug-a-boo scare of the annihilation of the horse upon the advent of the automobile, the future will undoubtedly decree definite and economic reasons for the existenee of both, leaving the great Darwinian law of survival of the fittest to pass the final and eternal decree in each case.

PERSONALS.

R. D. Miller, who has gas and electric interests at Buffalo, N. Y., was at San Francisco during the past week.

Tracy E. Bibbins, of the General Electric Company's San Francisco district office, is visiting the Eastern factories.

A. Albrecht, who is interested in the New Monterey & Fresno Railroad Company's project, was a recent San Francisco visitor.

W. F. Lamme, electrical engineer, returned to his San Francisco office last Monday from a trip through the interior of the state.

Charles S. S. Forney, president of the Southern Counties Gas Company, of Los Angeles, was a recent arrival at San Francisco.

H. E. Sanderson, Pacific Coast manager for the Bryant Electric Company, is making an extensive tour of the Pacific Northwest.

A. B. Domonoske has accepted the position of Instructor in Mechanical Engineering at the State University and is now busily engaged in planning his work for the year.

H. R. Noack, manager of Pierson, Roeding & Co., is in the Kings River Canyon on a camping trip with A. H. Babcock, electrical engineer for the Southern Pacific Company.

J. S. Torrance, vice-president of the Home Telephone Company, of Los Angeles, passed through San Francisco during the past week, on his way to Klamath Lake with Col. W. H. Holabird.

George E. Pillsbury, chief engineer of the Pacific Electric Railway Company of Los Angeles, spent the past week at San Francisco, accompanied by J. A. Lothian and B. L. Dowell, of the same corporation.

K. T. Wang, a prominent engineer from China who has been visiting England this summer, sailed for the Orient last Tuesday after inspecting the various electric power plants of San Francisco and vicinity.

J. P. Jollyman, electrical engineer, has left the Great Western Power Company and will on September 1st, assume a similar position with the Pacific Gas & Electric Company under J. H. Wise, the assistant general manager.

Frank H. Ray, of New York, who is heavily interested in the Rogue River Light & Power Company, recently spent several days at San Francisco, on business connected with the new hydroelectric plant that is under construction on the Rogue River.

R. G. Hanford, who is associated with F. M. Smith and W. S. Tevis in the United Properties Company, controlling electric railways and electric power plants at Oakland and San Francisco, returned to San Francisco from New York last Thursday.

Charles Gilcrest, instructor in Electrical Engineering at the University of California, has again assumed his duties at the state institution. Mr. Gilcrest is receiving the congratulations of his friends, having taken unto himself a blushing bride during his vacation.

G. W. Howson is engineer in charge of the work which was recently commenced on the Sierra and San Francisco Power Company's new impounding dam, on the upper waters of the Stanislaus River two miles below the Relief Dam. Ford Bacon & Davis, have general supervision as engineers, and S. I. Goodfellow of the Sierra & San Francisco Power Company, is superintendent at the dam site.

Patrick Broderick, a former commissioner of public works, has been appointed by the Board of Works as superintendent of construction of the Geary Street Municipal Railway at a salary of $6,000 a year. A. M. Hunt will be continued as consulting engineer on the project. A large force of men is engaged in grading the roadbed. The trolley wire has been strung and it is expected that the road will be placed in operation as an electric line next summer, with current purchased from some existing power company.

ELECTRICAL CONTRACTORS' NOTES.

The wiring for the new home of the Knights of Columbus at San Francisco has been awarded to the Central Electric Company.

The Enterprise Electric Company of San Francisco have moved from Eighth street, near Mission, to 640 Mission street.

The wiring for the new Masonic Temple at Van Ness avenue and Market street, was awarded to the General Electric Construction Company. This firm is doing a great many large jobs, among which are the Olympic Club, County Jail, Lowell High School, Sunset Publishing Company and Central Creamery, in San Francisco, besides the Santa Cruz Postoffice, and the Nicholas Building and the Schadt Building in Sacramento. The Central Creamery building is the largest conduit job on the coast.

Secretary Hanbridge contributes the following interesting side-light on a live topic:

Why Is a Bidder?

It is with a great deal of amusement that we note the claims of some of our political engineers, that city and state work can be done cheaper by day work than by contract. We doubt the sincerity of their statements when they say so. They may advance the statement that better work can be obtained. Still we don't agree with them, as the United States Government is not suffering from poor contract work.

There is only one way to obtain good work at a fair price, and that is by placing the work in the hands of competent engineers, to lay the same out carefully, let by contract to lowest responsible bidder, then exact from the contractor what he has agreed to do to the letter—no more and no less.

By doing so, a class of contractors will seek the state and city business that will fill the list with responsible bidders. The above, in reference to results, applies to private work as well as to public.

Another practice that is not to be commended is the taking of figures on a contract and then letting it by day work, which is a practice that has been carried on in the State Engineers' office.

A recent job of electric work from the above-mentioned office brought in only three figures. The firms that submitted two of these bids had not been in business over four months, and the third, although one of the largest contractors in the United States, was bidding for the first time on California state work. The last named was low, but the usual note came from the State Engineers' office: "We consider we can do it cheaper by day work."

It costs money to estimate work; it costs money to look at the state plans, as a deposit is required to insure that the plans will be returned; it also costs money to submit a bid to the state, as a certified check is required for good faith from the contractor. Why should the state not, at least, be fair and award the work to the lowest bidder?

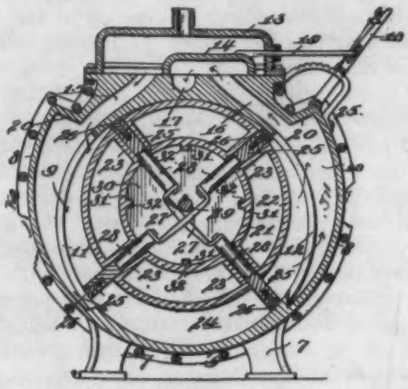
While the above applies to a practice that has been carried out by many of our state institutions, it also applies to private work as well; while every man has a right to buy where he can get the most for the least money, still we all like fair play.

MEETING NOTICES.

There will be a meeting of the Lamp Manufacturers at Camp Cloverack, Association Island, New York, for the week of Septembeh 3, 1911. The island is in Lake Ontario, about 20 miles from Watertown, N. Y. Much pleasure and profit is anticipated by all who are planning to attend.

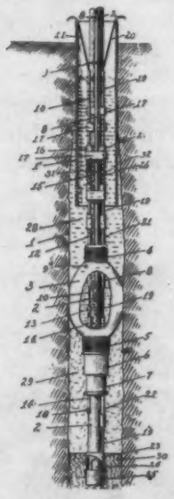
PATENTS

1,000,371. Rotary Engine. Gilbert Brickley, Missoula, Mont. A rotary engine comprising a cylinder having inlet and exhaust ports, a rotor eccentrically mounted in the cylinder, said rotor comprising inner and outer shells and a connection therebetween, the outer shell being in contact with the cylin-



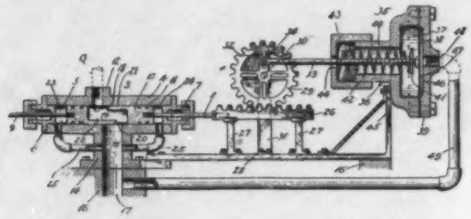
der wall at one point, radially slidable wings carried by the rotor and in contact with the cylinder wall, a shaft extending through the rotor, a disk fastened to the shaft and having a notched periphery, said disk being located within the inner shell of the rotor, and lugs on said inner shell extending into the notches.

1,000,583. Packer for Operating Gas, Water, and Oil Wells. Augustus Steiger Cooper, Los Olivos, Cal. A device for operating gas, water and oil wells, consisting of a dilatable and collapsible packer; means operatable from the mouth of the well to effect the expansion of said packer to cause it to close the cross sectional area of the well; means operatable from the mouth of the well to effect the collapse of the packer,



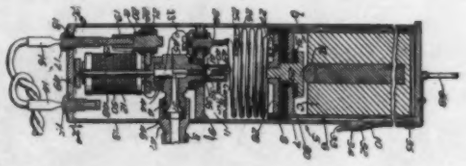
including a spring held valve acting automatically to close an outlet opening in the packer and an operating member extending to the mouth of the well; a flow pipe extending from the mouth of the well, through the packer and into the well below the packer; and means operatable from the mouth of the well to open and close the lower end of the flow pipe.

1,000,588. Balanced Valve. Clarence A. Cummings, Fresno, Cal. A balanced valve comprising a body, a gate sliding within said body and provided with a duct passing transversely therethrough, said duct having a passage extending longitudinally of said gate and having an enlarged opening on the side of said gate disposed toward the high pressure admission point, said gate having a single opening of reduced size with respect to said enlarged opening disposed on the side of said gate toward the low pressure side of said gate, said passage having an area on its upper side exposed to the



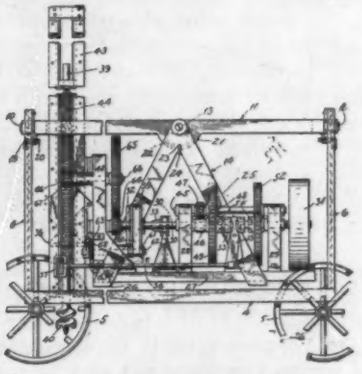
pressure within said duct tending to press said gate toward the high pressure side of said valve, and also having an area exposed to the high pressure and tending to force said gate toward the low pressure side, said gate being arranged to cut off on the low pressure side, said areas being arranged so that the pressure on said gate from the low pressure side substantially balances the pressure on the high pressure side.

1,000,972. Electropneumatic Photo-Exposure Apparatus. Karl W. Thalhammer, Los Angeles, Cal. The combination in electro-pneumatic photo exposure apparatus of an air-tank



having an outlet, a valve normally closing the outlet, means to compress air in the tank, and electro-magnetic means to open the valve.

1,000,578. Power-Driven Post-Hole Excavator. Robert T. Burdette, Los Angeles, Cal. In a machine of the class described, in combination, a main frame, wheels supporting the same and constantly resting upon the ground, a tilting frame mounted on said main frame to swing on a horizontal axis, means for locking said tilting frame, a hanger supported on



said tilting frame on a horizontal axis transversely disposed to said first axis, a guide supported on said hanger, a spindle having an auger and adapted to penetrate the earth, means for advancing said spindle on said guide, and means for rotating said spindle, said last two means being mounted on said hanger.

INDUSTRIAL

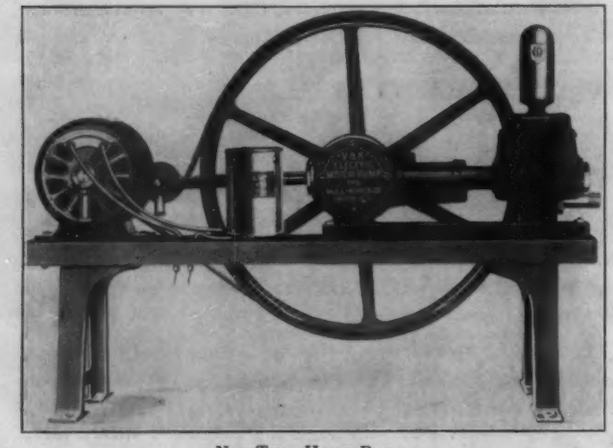
V AND K MOTOR DRIVEN HOUSE PUMP.

One of the problems that often confronts the property owner in rural and suburban districts is a troublesome and more or less crude water system. The Vaile-Kimes Company of Dayton, Ohio, are manufacturers of an electric motor pump, which, when installed with a compression, or pneumatic tank, makes an independent reliable automatic water system for all purposes. It pumps the water direct from the cistern, well, lake or stream into a tank under pressure and from there it is distributed to the house.

In cities where water rates are high or where the pressure is low, and where homes are supplied with electricity, the "V and K" pump forms are efficient and inexpensive means of water supply. It is of sufficient capacity to furnish the average suburban home with water under pressure for bath rooms, kitchen, laundry and sprinkling purposes.

The power is obtained from a ⅛ h.p. Westinghouse small motor, used so extensively for the operation of small machines.

The first cost of this little outfit is comparatively small considering its capacity and efficient operation. The operating expense is very slight, as the motor is so well designed and built that the cost of current consumed does not exceed two cents an hour.



New Type House Pump

An automatic switch, governed by the water pressure in the system, controls the operation of the motor. This switch starts the motor automatically when the pressure falls to a given point and stops the motor when the maximum desired pressure is reached. No attention is therefore required to keep up the water supply. The pump is belt driven and is equipped with an automatic belt tightener which keeps the belt always tight. A large air chamber makes the discharge smooth and uniform.

The pump may be arranged for mounting on the wall by substituting brackets instead of the legs.

WESTERN ELECTRIC EARNING AT RATE OF $66,000,000 YEARLY.

For July the Western Electric Co.'s gross sales show a falling off of 3 per cent as compared with July, 1910, but the seven months of the current fiscal year which have elapsed are 4 per cent ahead of the corresponding period of last year. It now seems unlikely that the company will realize its earlier prospects of a $71,000,000 year, but the showing to date, which is at the rate of $66,000,000 for the year, is close behind the company's high record of $69,000,000 for 1906.

In the east the company's sales reports for July compare favorably with those of July, 1910, the decrease for the month coming from the central and western districts. Cable manufacturing department shows the chief decrease, the electric supplies branch show a small gain and business in telephone apparatus being good. Inasmuch as last year the falling off in business was first noted in the East it is not unnatural that this section of the country should show some increase this year.

Abroad the company's business is satisfactory, showing a larger rate of increase than here, in fact.

It is of interest to note that with the growth of the company, with a corresponding increase in its number of customers, the unit of orders, that it to say the average size of each order, decreases. Last year the average of sales was $72, which was considerable decrease over a period of years, and this year the unit of sales is in the neighborhood of $70. The Western Electric is employing 26,000 persons as compared with 29,000 in 1906, which was the largest number ever on the company's books at any one time. On January 1, 1909, there were less than 18,000 persons employed, which number has been increased to 23,500 approximately, at the beginning of the current year.—Wall Street Journal, Aug. 10,1911.

That the officials of the Western Electric Company are firm believers in the present prosperity and great future of the south is evinced by the fact that they will soon open a new house there. Arrangements have just been completed whereby the Western Electric Company will soon open a new house at Richmond, Virginia, where a complete stock of telephone apparatus and supplies, power apparatus and general electrical supplies will be carried. This will enable the Western Electric Company to give their customers in this territory the same prompt service which characterizes that given by the other twenty-four houses of the company's distributing organization.

Mr. H. W. Hall, formerly manager of the Denver house, will have charge of the Richmond organization, and with him will be associated specialists on the various lines handled.

COMPOSITE TELEPHONE SETS.

The signaling apparatus used with the No. 1312-A Telephone set and the No. 1314-A portable composite telephone, calls between stations by means of what is known as a howler.

New Western Electric Telephone.

When one operator wishes to call another, he presses a button in the side of the telephone set, this action automatically

starts an interrupter working, which sends out high frequency signaling current over the line and causes the howlers at the other stations to give the desired signal in a loud whistle or shriek.

No change in the telegraphic apparatus or its operation is necessary to adapt the system to telephone operation also. Each telegraph station is merely bridged with a condenser and a resistance and the telephone apparatus is connected between the line and ground. A condenser in each telephone set prevents the telegraphic current from passing through this apparatus to ground.

The sets employ local battery talking, and a condenser is bridged in series with the receiver which itself is shunted by a retardation coil. This coil prevents the telegraphic currents from passing to ground over the telegraph line beyond the telephone station, but does not impede the telegraphic currents, because these are of much lower frequency than those generated by the telephone.

It is easily possible to talk on a composited line of this character while telegraph signals are passing over it, without any interference whatever. The length of telegraph lines over which such service can be given is more or less limited. The most satisfactory operation is obtained where the telegraph is used for through business and the telephone for local business, on the same line. On a short line, service will be better and more stations can be operated than on a long line, and the usual maximum limit is generally taken at 125 miles of No. 8 B.W.G. iron wire equipped with 7 telegraph stations and 5 telephone stations.

On some railroad systems, through lines are composited over different sections, as for instance, in the case of a through telegraph circuit extending from New York to Wilmington, North Carolina which is composited between Richmond, Virginia, Rocky Mount, South Carolina. It can thus be seen that the section of line between these two points is serving a double purpose simultaneously, and thereby saving the expense of installing another circuit between these points.

NEW GENERAL ELECTRIC BULLETINS.

In Bulletin No. 4868 are illustrated and described rotary converters for railway and lighting, in capacities ranging from 25 to 2500 kw. The bulletin illustrates also a portable substation in which a converter is installed.

Motor Generator Sets is the subject matter in Bulletin 4849. It contains brief descriptions of generator sets of different styles and sizes. These sets are made up of various combinations of alternating and direct current generators and motors, and range in capacity from 95 kw. to over 7000 kw.

Bulletin No. 4858 is devoted to Single-Phase Repulsion Motors.

Bulletin No. 4866 is devoted to Thomson Instruments for Switchboard Service. This bulletin supersedes all previous bulletins issued by this company devoted to this type of instrument.

Bulletin No. 4872 describes an outfit manufactured by the company for the purification of transformer oil of all kinds, crude petroleum for oil fired furnaces, insulating varnish and japan, benzine used for cleaning purposes, transformer oil used for impregnating insulating press-board and wood, cylinder oil used in certain types of electrical apparatus, and viscous insulating compounds.

In Bulletin No. 4867 are described and illustrated electric locomotives for switching and light freight service, varying in weight from 22 to 35 tons, according to the service requirements and type of electrical equipment employed.

Bulletins No. 4837 to 4843 inclusive, form a series illustrating and describing in detail all of the circuit breakers manufactured by that company.

TRADE NOTES.

Theo. F. Dredge, Monadnock Building, San Francisco, has been appointed Pacific Coast agent for the Taylor return trap system for coil draining, water lift and automatic boiler feed.

The Yosemite Lumber Company of San Francisco, which recently purchased a Corliss engine and a complete sawmill equipment from the Allis-Chalmers Company. has ordered a 450 kw. normal rated, mixed pressure, Allis-Chalmers steam turbine generator set. Complete auxiliary apparatus has also been ordered for the new sawmill and planing mills now under construction at Merced Falls.

The General Electric Company reports the following sales: To the Bakersfield & Kern Electric Railway Company, six complete 2-motor, G. E. 203 car equipments with K-36 controllers, Sprague air brake equipments, C. P. 27 air compressors, etc. To Great Western Power Company, nine W. C. 60, 1250 k.v.a. 35° C., 95,000-v.—90,000-v. primary, 24,000-v. secondary water cooled transformers with a number of full capacity taps on the secondary, ranging from 6,050 v. to 23,100 v.

With the more prevalent use of electric light and power in Evansville, Ind., the Evansville Gas & Electric Company have found it necessary to increase their generating facilities. In previous enlargements at this station, the turbine type equipment has invariably been given preference, the plant, up until a short time ago, comprising two vertical turbines and one Allis-Chalmers unit. Due to the promising growth of their electrical load, the operating company recently decided on a substantial addition to their present equipment, and accordingly placed an order with the Westinghouse Machine Company for a 1600 kw. turbine of the improved high-speed, double-flow type. The turbine will follow the familiar Westinghouse construction, partial expansion of steam taking place through a high-pressure impulse section, further expansion to a 28-inch vacuum being then effected through Parsons blading of a standard design. The electrical end of the unit comprises a Westinghouse generator normally rated at 2000 k.v.a, deliving 3-phase, 60 cycle current at 2300 volts.

NEW CATALOGUES.

The Rockwell Furnace Company of New York and Chicago has just issued Bulletin No. 29 on Labor Automatic Stop-Valve. The booklet is well illustrated covering all essential details of the stop-valve.

The H. W. Johns-Manville Company, are distributing their new Electrical Supplies Catalogue No. 15, which contains over 400 pages, and illustrates and describes the Electrical Products of the company. A new solder known as Solderall is also described consisting of a non-corrosive flux, combined with solder in paste form, and contained in collapsable tubes.

The Westinghouse Electric & Mfg. Company has issued revised editions of the following sections of Perpetual Catalogue No. 3001: No. 121 on "Type CC Carbon Circuit Breakers"; No. 231 on "Expulsion Type Fuse Blocks"; No. 233 on "Outdoor Type Fuse Blocks"; No. 327 "Type C Watthour Meters"; and No. 667 on "Type KD Generator and Feeder Panels". These revised sections embody new features of interest. The following sections describe an entirely new line for switchboard meters which are very compact in size and yet retain the accuracy, the long scale and other advantageous features of the older types: No. 307 covers "Types L, SL and TL switchboard meters; No. 310 "Types FM and TM switchboard meters; No. 311 Type FD and TD Frequency Meters; No. 312 "Types FI and TI Power Factor Meters; No. 314 "Type TG Electrostatic Ground Detectors and Voltmeters; No. 327½ "Type OA Watthour Meters and No. 436 covers "The New Nursery Milk Warmer," while Section No. 740 covers "75 Kva. and 100 Kva. Distributing Transformers."

NEWS NOTES

FINANCIAL.

ASOTIN, WASH.—An ordinance bonding the town for $35,000 to construct a waterworks system has been passed.

SUMAS, WASH.—This place has decided to call for bids on a bond issue in the sum of $7000 for the construction of a municipal electric lighting system.

SIERRA MADRE, CAL.—The City Council passed an ordinance providing for the issuance of $40,000 waterworks bonds authorized by the voters in December, 1910.

STITES, IDAHO.—D. E. Frank, manager of the Kooskia Milling & Power Company, has applied to the city council for a franchise to furnish electric light and power.

SAN DIEGO, CAL.—John D. Spreckles bid $60,000 for a 41-year extension of franchises over all lines of the San Diego Electric Railway Co., which was accepted by unanimous vote of the City Council.

PROSSER, WASH.—Hearing is set for September 6th for the county commissioners to decide on granting the Pacific Power & Light Company an electric light franchise at White Bluffs and Benton City.

SALEM, ORE.—Six per cent., first mortgage gold bonds of the Bay City Land Co., interest payable semi-annually are being sold for the extension of the water and electric light systems of Bay City, Ore.

PRINCE RUPERT, B. C.—The Prince Rupert Hydro-electric Company has 50 surveyors in the field preparatory to supplying power and light systems for this place. The plans call for the expenditure of $600,000 within twelve months and the total sum of $2,500,000 within four years.

LOS ANGELES, CAL.—The City Council has formally adopted the report of the finance committee, authorizing the sale as soon as needed of $525,000 each of harbor and power bonds. An extra $25,000 was added to the amount of each issue for convenience in issuing them in proper denominations.

FALLON, NEV.—The City Council has opened bids for the purchase of $35,000 waterworks bonds and $10,000 sewer bonds. Bids: Nixon National Bank, Reno, bid par or $45,000; C. H. Coffin, Chicago, bid $45,226. The latter failed to comply with requirements of furnishing certified check of 10 per cent and Nixon National Bank's bid was accepted.

ALAMEDA, CAL.—The City Council recently definitely decided on the propositions to be incorporated in the forthcoming bond issue to be held about the middle of September. The propositions as finally adopted are: For electric light plant betterments, $115,000; for park and playground equipment, $12,000; for new fire-alarm system, $75,000; for lot adjoining the electric light plant, $2500; for municipal wharf, $15,000; for portion of Saroni tract to be added to Lincoln Park, $16,000; for Hayes tract to be added to Washington Park, $30,000; for fire equipment, $30,000; for additional auto truck for West End, $6500; total $234,500.

SAN FRANCISCO, CAL.—Holding that there were no valid reasons why the affairs of the San Joaquin Valley Electric Company should be placed in the hands of a receiver on the motion of John J. Doyle, possessor of but two shares of the company's stock, or that the company should be restrained by injunction from issuing or selling $1,000,000 worth of mortgage bonds for the financing of the building operations of the company, Judge Sturtevant recently denied the petition for the appointment of a receiver and the issuance of the injunction. The trial of the petition and its accompanying suit was held August 19. The action of the court followed the presentation of arguments by Attorneys Frank H. Gould and Gavin McNab of the San Joaquin Co.'s counsel, in which it was testified that Doyle's suit was being used by the Tidewater and Southern Ry. Co., a competitor of the defendant company for the transportation business between Stockton and Modesto, as a mask behind which a campaign was being fought against the San Joaquin corporation.

INCORPORATIONS.

LOS ANGELES, CAL.—The Pacific Light and Power Co. of Los Angeles has been incorporated for $40,000,000, by H. E. Huntington, W. G. Kerckhoff, K. Cohn, G. S. Ritton, Charles Forman, A. M. Kemp and Howard Huntington.

SAN FRANCISCO, CAL.—Articles of incorporation of the Napa and Clear Lake railroad have been filed. The capital stock of the company being given as $500,000, divided into 5000 shares of $100 each. The directors are C. W. Conlisk, W. M. Rank, and R. A. Morton. The two latter have subscribed $100 each, while Conlisk has taken $109,800 worth of stock. The stated purpose of the corporation is to build a standard-gauge road from Napa to Lakeport, a distance of 90 miles.

ILLUMINATION.

KLAMATH FALLS, ORE.—An ordinance granting to the W. F. Boardman Co. a franchise for gas and heat has been passed by the council.

BURNS, ORE.—James D. Fellows has secured a 25-year electric light franchise and is purchasing machinery for the equipment of a high clas electric light plant.

SAN DIEGO, CAL.—The extension of the San Diego Consolidated Gas & Electric Company's gas mains east from City Heights to La Mesa Springs is now assured.

CHOTEAU, MONT.—Julius Hirschberg has sold the local electric light plant to H. McCullough of Corbin, who will make repairs and furnish light by September 1st.

VANCOUVER, B. C.—The British Columbia Electric Railway Company has notified the city electrician that a large number of street lights will be installed at Hasting Townsite, and other sections.

BOISE, IDAHO.—The council has closed a contract with the Idaho-Oregon Light and Power Co. for furnishing light to the city for seven years for 300 arc lights at $126,000. A modern cluster light system will be installed as soon as possible.

LEWISTON, IDAHO.—Work will start at once on remodeling the gas plant and addition to the works of the Pacific Power & Light Company. The plans call for new brick or concrete building, equipped with modern machinery, to cost $35,000.

LOS ANGELES, CAL.—The Board of Supervisors has accepted the bid of the Southern California Edison Co. for lighting the Hawthorne Lighting District, southwest of the city at $1.25 per lamp per month, the company will set poles and string wires at once.

TACOMA, WASH.—A contract has been awarded Evans & Dickson, electrical contractors and engineers, by the Park Board for the lighting system in Wright's Park. The contract calls for the erection of ten flaming arches on 35-foot iron poles with an underground system of wiring. This work will cost about $4000.

TRANSMISSION.

LEWISTON, IDAHO.—The Nezperce Power and Light Co. is making preparations to invade the Lewiston district with power and light.

MEDFORD, ORE.—Residents of Griffin creek have voted unanimously for the construction of a pole line along Griffin creek. The county rock quarry and about forty families can be reached by this line.

SALT LAKE, UTAH.—Sealed bids will be received for the construction of hydroelectric power plant at Riverdale near Ogden according to the plans and specifications now on file at the office of the Davis & Weber Counties Canal Co., Room 316, First National Bank Building, Ogden City, Utah.

SAN JOSE, CAL.—That the Great Western Power Co. meant business when it announced its intention recently to invade the local field with a power service in competition with the Pacific Gas and Electric Co. was shown yesterday when a petition was presented to the Supervisors, asking them to advertise for sale a franchise for a transmission pole line for the entire county. The Great Western declares it is its bona-fide intention to be a bidder for the franchise. The proposed franchise will run fifty years and will carry with it the provision that the company annually, after the first five years, turn over two per cent of its gross earnings to the county.

TRANSPORTATION.

NORTH VANCOUVER, B. C.—The North Vancouver Coal & Supply Company will erect an electric hoist with a 15 horsepower motor.

MIDDLETON, IDAHO.—Plans have been completed for the new Swan Falls Power Company's substation, costing about $2500, to be built here. Lee R. Cooke, Nampa, is the architect.

MILLSIDE, B. C.—It is announced that the construction will be commenced at once of the proposed extension of the British Columbia Electric Railway from New Westminster to Millside, British Columbia.

SALT LAKE, UTAH.—Applications for franchises to build street car lines on 15th East and on N. State street to the capitol building site, have been filed with City Recorder B. S. Rives, by the Utah Light & Railway Company.

LOS ANGELES, CAL.—Contracts have been made for the extension of the West Forty-eighth street car line of Los Angeles Railway corporation from the terminus at Forty-eighth and Arlington avenue through the Angelus Mesa Tract.

ARDLEY, B. C.—It is understood that the Great Northern Railway Co. will install at Ardley, British Columbia, where the Burnaby line of the British Columbia Electric Railway crosses its tracks, an interlocking plant at a cost of over $7000 which will provide for switching from one line to the other.

VICTORIA, B. C.—The Electrical Manufacturing Company has received the contract for supplying 14 miles of wire for the police alarm service, at $23 per mile, and the following: 275 cross arms at 30c each; 550 insulators, at $4.75 per 100; 500 oak pins, at $19 per 1000. The contract for 500 arc lamps will be awarded to Hutchinson Bros., at $3.35 each.

LOS ANGELES, CAL.—The construction of a broad-gauge road from Homewood to Watts, for the Redondo line of the Pacific Electric Co. is to begin at an early date. Arrangements for the franchise are now about settled. When this connecting link is completed it is the plan of the company to change the entire line from Homewood to Redondo into a broad gauge road, that broad-gauge cars might be operated through to Los Angeles by way of the four-track system between Watts and the Pacific Electric building.

TOMBSTONE, ARIZ.—F. M. Winters, Jacob Kleck, W. S. Furniss, Dr. J. M. Sweetman and C. C. Lewis will soon incorporate a company for constructing a $600,000 interurban car line connecting Hole in the Rock, Sotts-Mesa, Glendale and Pebrio, making a line 40 miles in length. Application for a franchise in Phoenix has been made to the City Council and track laying will commence in thirty days.

WOODLAND, CAL.—That the preliminary survey of the West Side Electric Railroad will be commenced this week is the announcement made by Melville Dozier Jr. of the Dozier Construction and Engineering Co. Three lines will be run between Red Bluff and Woodland, from which a permanent route will be selected. A full corps of surveyors will be placed in the field and the surveys will be made with all the speed possible with the preparation of full and accurate data. It is expected that Dozier will be able to make a report to the executive committee within five months. The survey will be begun at this city. The road is estimated to be about 120 miles in length.

SAN RAFAEL, CAL.—Geo. D. Shearer, a local real estate agent, says that he has the backing of capitalists capable of making the San Rafael Electric Road a reality if the necessary rights can be secured from the city. The franchise asked by Shearer provides for four different routes. One of these is described as beginning at the west corporate limits of the city and extending through 4th street to Irwin street, near Union Station. Another route is proposed to run from the intersection of 4th street and Petaluma avenue to the northern city limits by way of Petaluma avenue. A third line projected would extend from the corner of 4th and B streets down B street to Bay View street and thence along Bay View to Marin avenue. The fourth route is described as extending from Union Station easterly to within a quarter of a mile of Schuetzen Park.

MERCED, CAL.—The survey of the Tidewater and Southern Railroad, the electric line now being built between Stockton and Merced has reached the city limits. For several days the corps of surveyors, in charge of J. C. Lindsay, have been making their headquarters in this city while working through the British colony, a subdivision adjoining town. Byron A. Bearce, general manager of the company and J. H. Wallace, chief engineer have arrived and will go over the surveyed line between this city and the Merced River before returning to San Francisco. The line as surveyed runs from Stockton to Merced, through French Camp, Escalon, Modesto, Ceres, Turlock, and a number of smaller towns in San Joaquin and Stanislaus counties, through Irwin City, Stevinson and Atwater in Merced County, passing through Hilmar, Jordan-Atwater and British colonies to reach Merced city. Branch lines are contemplated for Livingston, Creassey, Winton and Yam; also a branch line in this county to leave the main line in Hilmar county and run to Newman on the west side of the San Joaquin River.

SAN FRANCISCO, CAL.—The cars which the Board of Public Works is to have built by contract for the city railway on Geary street will be of the pay-as-you-enter type, all steel construction, about 53,000 pounds in weight, forty-seven feet one inch in length and with a seating capacity of forty-four Forty-three cars are to be built, completely equipped and ready for operation. The specifications provide that they shall be delivered at San Francisco within 270 days from the date of the contract. This means that the city's Geary street railway, even if the construction of the roadbed is hurried cannot be put in operation until some time next year.

Public Works Commissioner Laumeister, who has supervised the details, visited Los Angeles, Chicago and other cities to see what equipment up-to-date street cars should have. He believes the public will be satisfied with the seating arrangements. On each side of the car there will be

seven seats for two persons, facing the front, and at the end will be a longitudinal seat on each side for four persons, all upholstered in rattan.

It was at first intended to have several open cars built for use in warm weather, but this idea was later abandoned, so none will be called for at present. When passengers wish to alight, they will press push buttons, which will be placed in the side posts, and a buzzer at each end will notify the motorman to stop. A motorman's seat is to be provided for each car. The specifications state that the desired schedule speed of the cars is to be approximately nine miles an hour, with an average of about eight stops per mile, and the maximum speed twenty-five miles per hour on level track.

TELEPHONE AND TELEGRAPH.

VANCOUVER, B. C.—It is understood that the British Columbia Telephone Company is taking a census of South Vancouver for establishing a branch exchange there.

VANCOUVER, WASH.—Lawrence Harmon has applied for a franchise for the installation of telephone and telegraph lines here and also for constructing a street car system.

DAYTON, WASH.—The Mt. Vernon Telephone Company has applied for an exclusive franchise for the right to erect poles, and construct a telephone line on certain city streets.

CORCORAN, CAL.—William Cromlie has purchased the local business of the Pacific Telephone and Telegraph Co. The central office will remain in Hotel Corcoran at present.

PASCO, WASH.—The Twin City Telephone Co. will soon spend from $25,000 to $30,000 in Pasco. A new cable plant is to be put in, work to begin this fall. R. Klingo is manager.

WASHINGTON, D. C.—The U. S. Navy Department is preparing to extend the Alaska wireless telephone system. A powerful station will be erected on one of the Aleutian Islands.

ABERDEEN, WASH.—The City Council has appointed a committee to confer with officials of the Pacific Telephone & Telegraph Company in regard to the betterment of the company's local system.

COLVILLE, WASH.—The Cedar Creek Independent Telephone Co., with its principal business at Boundary, Stevens County, Wash., has filed a petition for a franchise to construct a system of telephone lines.

LOS ANGELES, CAL.—The Pacific Telephone and Telegraph Co. has had plans prepared for and has taken bids for the erection of a three story and basement, reinforced concrete telephone building to be erected at the corner of Denker and Vernon avenues.

GREAT FALLS, MONT.—Wallace S. Perrine, supervisor of the Jefferson National Forest, south of this place, has started work on the construction of 34 miles of new telephone line in the Jefferson forest. Mr. Perrine is at present at Neihart, to institute work.

WATERWORKS.

DORRIS, CAL.—Town Clerk, F. R. Chapman, received sealed bids, until August 25th, for building the Dorris waterworks system.

ANAHEIM, CAL.—Plans and specifications for the Anaheim sewer system have been presented to the Board of Trustees and accepted.

PUYALLUP, WASH.—The commission of Tacoma has agreed on the sum of $25,000 as the purchase price of the 160 acres at Maplewood Springs, on which this place is considering the establishment of a new water system. It is probable that Puyallup will purchase the tract.

RED BLUFF, CAL.—Chas. Cofer, water locator, recently located spots for five artesian wells on the Lutheran colony land in Antelope valley.

WATSONVILLE, CAL.—The plans and specifications for a water system, filed with the Board last February by C. E. Moore, have been adopted.

COOS BAY, ORE.—Stannard & Richardson, of Portland, have been commissioned to prepare plans and specifications for a municipal water system.

NAMPA, IDAHO.—There is talk of bonding the city to raise $40,000 to extend the present water system and replace wooden pipes with cast iron.

BAKERSFIELD, CAL.—Engineer Wm. Mulholland has offered to prepare plans for a water system for East Bakersfield at a cost of between $1000 and $1500.

WOODINVILLE, ORE.—This place will meet to consider plans for the water system. It is probable that plans and estimates will be ordered and bids called for.

WOODBURN, ORE.—The City Council has under discussion a water system improvement. The kind of system needed will necessitate an outlay of $20,000. Larger pumps will be needed.

TALENT, ORE.—Postmaster T. L. Stewart, who is also an engineer, has completed a report for the trustees of Phoenix for a water system for that place. The system is gravity; estimated cost $19,120.

POCATELLO, IDAHO.—James A. Murray, owner of the Pocatello Water Co., will furnish water sufficient to supply fifty thousand people, if the council will give him permission to install a motor system.

RIVERSIDE, CAL.—The City Council has awarded a contract to the Los Angeles Manufacturing Co. amounting to over $6,000 for the construction of pipe lines and for an irrigating system for Fairmount Park.

HARLEM, MONT.—The American Light & Water Company of Chicago, has been awarded the contract for the construction of a municipal water system at this place at $30,940. Ground will be broken September 1st.

OROVILLE, CAL.—The Pacific Gas and Electric Company has had a corps of surveyors engaged in making surveys for a great storage reservoir in Oregon House in Yuba County. From the reservoirs the plans call for the water to be diverted to the Colgate power plant by means of a reservoir, which will be approximately two miles in length. It is understood that the estimated cost for the total project is in the neighborhood of $1,000,000. It is proposed by the company to erect a huge dam across Oregon House Creek, which is a branch of Dry Creek, in its turn a tributary of the Yuba River. The area covered by the water the dam would impound would be approximately 700 acres.

LOS ANGELES, CAL.—The Board of Supervisors has passed an ordinance granting to the Valley Water Co. a franchise for a period of forty years to maintain a system of water pipes in certain portions of Los Angeles County.

HERMISTON, ORE.—This place has voted bonds in the sum of $25,000 for the construction of a municipal water system. The system calls for a 250,000 gallon reservoir on Hermiston Butte and water will be transferred by a 12-inch main.

OXNARD, CAL.—The Board of Trustees has taken the initial step in the matter of municipal ownership of the water system by accepting the contract of the engineering firm of Olmstead & Gillelan to prepare plans and specifications and superintend the construction work for 8 per cent of the bond issue which is to be $100,000.